Environmental Assessment
Finding of No Significant Impact
Section 404 (b)(1) Evaluation

Maintenance Dredging of the Kennebec River Federal Navigation Channel Sagadahoc County, Maine

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Environmental Assessment

A. Introduction

The Kennebec River Federal navigation channel is located in Sagadahoc County near Bath, Maine. It is authorized to a depth of 27 feet mean low water (MLW) and 500 feet wide in the vicinity of Bath and downstream to its entrance near Popham Beach. Frequent shoaling of the Kennebec River means that maintenance dredging is required every few years. Typically, maintenance dredging occurs during a one month period between late fall and spring. About 50,000 cubic yards (cy) or less of sand is removed from two locations in the Federal channel. The two areas most frequently in need of dredging are: 1) south of the city of Bath near Doubling Point, and 2) the mouth of the Kennebec River near Popham Beach. The disposal site for material dredged from the Doubling Point area is at the previously used in-river disposal area located just north of Bluff Head. Material dredged at the river mouth near Popham Beach has been disposed of at the previously used disposal site just south of Jackknife Ledge (Figures 1 and 2)

The frequent need for dredging in the Kennebec River prompted the preparation of a generic Environmental Assessment (EA) in March 2002 to cover maintenance dredging in the Kennebec River for ten years (until the year 2012). The generic EA stated that due to concerns about the endangered shortnose sturgeon *(Acipenser brevirostrum),* dredging in the Doubling Point area would only occur between November 1 through April 30. However due to the critical need to move a U.S. Navy destroyer in the fall of 2011, it is anticipated that dredging of the federal navigation channel will need to be conducted in August, 2011, outside of the dredging window for shortnose sturgeon. In addition, the Kennebec River population of the Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon was recently listed as an endangered species by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. This listing provides measures to protect the Atlantic salmon from adverse effects of dredging as well as other activities. Therefore, dredging of the channel will need to be conducted in a way that will avoid and or minimize any potential effects to both the endangered shortnose sturgeon as well as the endangered GOM DPS of Atlantic salmon. This Environmental Assessment (EA) will cover the dredging that is proposed to be conducted in August 2011 and its associated environmental effects.

B. Purpose and Need

1) Project Need

Maintenance dredging is necessary to provide safe operating depths for deep draft vessels transiting to and from Bath Iron Works (BIW), a large shipbuilding facility presently under contract with the U.S. Navy. Shoaling inhibits passage of vessels being constructed or repaired at BIW to and from open water. These vessels include frigate, destroyer and cruiser class ships for the U.S. Navy and container cargo ships for commercial firms. The proposed dredging in August of 2011 will involve maintenance dredging of the two portions of the authorized 27-foot deep, 500-foot wide Federal navigation channel mentioned previously. A January, 2011 hydrographic survey indicated that the channel had shoaled to 19.7 feet mean low water (MLW) near Doubling Point, and to less than 27 feet MLW at the Popham Beach area. Based on this information, there is concern that US Navy Destroyers cannot transit the channel safely even during high tide. The next scheduled ship transiting of the channel is in mid-February, 2011, when a Navy destroyer, the SPRUANCE is scheduled to transit through the channel for sea trials. At that time it will still be under construction and ownership of Bath Iron Works and will therefore be navigated by their pilot who is extremely familiar with this area and is expected to be able to successfully circumnavigate the shoaling bv bringing the ship through an area of deeper water outside of the channel. However, the final delivery of the SPRUANCE to the U.S. Navy and subsequent deployment is scheduled for September 1, 2011. At that time a Navy Commander will be in charge of sailing the U.S.S. SPRUANCE out from Bath, Maine to Norfolk, Virginia. This pilot will not have the lifelong experience with the Kennebec River that the Bath Iron Works Pilot has, and therefore will be relying on adequate depths in the federal channel to safely navigate the vessel. Therefore it will be necessary to restore the channel to its authorized depth of 27 feet in order to allow the safe transit of this vessel in September 2011.

Shoaling of the channel has created a Critical Safety Impact. The authorized depth of the Kennebec Channel is 27 feet, and the shoaling has reduced the controlling depth to 19' 7". The maximum vessel draft for this class of destroyers is approximately 28 feet, 9 inches at the bow, and is achieved by de-ballasting tanks to produce this draft. Further de-ballasting of tanks unacceptably reduces the vessel margin of stability and impacts ship maneuverability characteristics, producing an unsafe condition for transiting the vessel in a challenging channel, especially if weather conditions deteriorate on the day of transit. Failure of the U.S.S. SPURUANCE to sail on the required date will have a Critical Impact to U.S. Navy Fleet Operations and National Defense. This impact will seriously and negatively affect U.S. Navy (USN) operational schedules, and will restrict the USN Fleet Commander's ability to surge deployable strike capability as directed by the National Command Authority (NCA). Delay to the ship's schedule creates an unacceptable limitation to the Navy's ability to execute NCA tasking while on a wartime footing.

2) Authority

The existing Federal navigation project at Kennebec River, Maine was adopted in 1902, and supplemented by River and Harbor Acts in 1907, 1913, and 1940. The project provides for a navigation channel 27 feet deep at MLW and at least 500 feet wide, extending from the mouth of the river near Popham Beach to about 13 miles upstream to the city of Bath. The portion of the 27-foot navigation channel above the bridge is considered inactive (See Figure 1).

Authority for the disposal of dredged material within the Kennebec River, relative to the Corps of Engineers, is granted from the State of Maine under Section 401 of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq.). A Water Quality Certification has been requested from the State of Maine to fulfill requirements for this emergency maintenance dredging and future maintenance dredging as described previously. A Clean Water Act Section 404 (b)(1) evaluation for the discharged of dredged material in nearshore waters has also been completed and can be found attached to this Environmental Assessment. Additionally, concurrence with our Consistency Determination has been pursued to fulfill federal obligations under the Coastal Zone Management Act of 1972 [16 U.S.C. 1456 © (1) and (2)]. All of these evaluations considered the proposed maintenance dredging project and future maintenance dredging as described herein.

C. Proposed Project Description

Dredging is needed to remove dangerous shoals from the channel in the vicinity of Doubling Point (just below Bath) and at the mouth of the river near Popham Beach. A total of about 70,000 cubic yards (i.e. 50,000 cubic yards from Doubling Point and 20,000 cubic yards from Popham Beach) of clean sandy material needs to be removed from the channel. The shoals, especially those in the Doubling Point area consist of massive sandwaves oscillating within vertical and horizontal ranges; the elevation at the tips of these sandwaves vary from -19.7' to -26.8'. As part of this proposal, advance maintenance may be performed to remove the sandwaves to a maximum elevation of -32' in an effort to improve the chance that adequate depths will endure. The proposed work will be performed with a hopper dredge over a three to five week period beginning on or about August 1, 2011. The material dredged from the Doubling Point area will be disposed of at the previously used in-river disposal site located north of Bluff Head in about 95 to 100 feet of water. This site was used in 1986, 1991, 1997, 2000, 2002 and 2003. Material dredged from the Popham Beach area will be disposed at a 500 yard circular disposal site located about 0.4 nautical miles south of Jackknife Ledge in depths of about 40 to 50 feet below MLW (Figure 3). The Jackknife Ledge disposal site was used in 1989, 1997, 2000 2002 and 2003. Material dredged from the Popham Beach area will be disposed at a previously used 500-yard circular near-shore disposal site located about 0.4 nautical miles south of Jackknife Ledge in depths of about 40 to 50 feet. As in previous years, the material dredged from the channel at the mouth of the river will be transported to the Jackknife ledge disposal area via the commercially traveled route.

The proposed work will be conducted using a hopper dredge. A hopper dredge removes material from the bottom by suction, lifting it through dragarms connected to the side of the vessel. A slurry of bottom material and water is brought to the surface where it is discharged into the hopper. As pumping continues, the solid particles settle into the hopper while the excess water passes overboard through overflow troughs. After the hoppers are full, the dragarms are raised and the dredge proceeds to the disposal site where the loaded hoppers are emptied through bottom opening doors. The doors are then closed and the dredge returns to the dredging area to repeat the cycle.

A mechanical dredge has also been considered if work is urgently needed during the warmer months, to reduce potential impacts to shortnose sturgeon. A mechanical dredge uses a bucket attached to a crane to lift the material from the bottom. The material is then placed into a scow which is then towed to the disposal location. The bottom doors (or hull) open to release the material to the disposal site. Once the material has been released the doors of the scows close and it is towed back to the dredge site where the process begins again.

A mechanical dredge is not the preferred dredge due to the currents and weather factors especially at the mouth of the Kennebec River. Although a mechanical dredge may reduce the potential for injury to the federally endangered shortnose sturgeon, it requires more time to complete the work than a hopper dredge, and therefore may increase the opportunity for interactions between the dredge and this species. Therefore, a hopper dredge is the preferred dredging method for the proposed dredging in August of 2011.

Future work will likely involve the removal of up to 50,000 cubic yards of sand. Approximately half of the sand will be removed from Doubling Point and the other half will be removed from the Popham Beach area. The amount of sand to be dredged, the length of time to remove the material, the time of year restrictions, and type of dredge may vary from year to year. See Table 1 for a dredging history of the project.

TABLE 1

Kennebec River Federal Navigation Channel Dredging History

YEAR	VOLUME (cubic yards)	CONTRACTOR	DREDGE
1950	108,830	U.S. Govt.-Lyman	Hopper
1953	58,390	U.S. Govt.-Lyman	Hopper
1956	4,707	U.S. Govt.-Hyde	Hopper
1960	54,535	U.S. Govt.-Comber	Hopper
1968	20,000	U.S. Govt.-Comber	Hopper
1971	54,535	U.S. Govt.-Comber	Hopper
1975	102,930	U.S. Govt.-Comber	Hopper
1982	53,300	U.S. Govt.-Comber	Hopper
1986	57,902	U.S. Govt.-McFarland	Hopper
1989	77,362	U.S. Govt.-McFarland	Hopper
1991	69,000	U.S. Govt.-McFarland	Hopper
1997	22,000	Contractor	Hopper
2000	20,000	Contractor	Hopper
2002	25,000	Contractor	Hopper
2003	22,310	Contractor	Hopper

D. Alternatives

1) No Action

Failure to dredge the Kennebec River channel would allow further accretion of sand at the proposed dredging sites. These shoals are south of the Bath Iron Works, an area heavily traversed by deep draft vessels requiring repair. Sea trials of newly constructed vessels, especially U.S. Navy and container cargo vessels also require safe transit of the river. Failure to maintain the channel to safe navigable depths would delay scheduled transits of vessels being built or repaired by Bath Iron Works. Shoaling can reach unsafe levels in the Doubling Point area for destroyer class vessels, even at high tide. These vessels would sustain significant damage to their hull if they were to contact the shoaled bottom of the channel. In addition there would be significant risk to the safety of the crew. Further shoaling will eventually make the channel totally impassible to other deep draft vessels. BIW is a major employer of the state; the inability of vessels to access this facility would represent a significant negative impact on the economic stability of the region. In addition, the inability of destroyer class vessels to transit the channel could potentially create a security risk during a wartime footing.

2) Modifications of Proposed Dredging

The authorized dimensions of the Federal channel in the Kennebec River are fully utilized by deep draft vessels using the river. Channel depth and width could not be reduced without negatively impacting these vessels. Previous dredging projects have involved dredging a significant amount of the two feet allowable overdepth in order to achieve the authorized depth of 27 feet MLW. Currently, the U.S. Navy relies upon the authorized channel depths, high tides, and reduced ballast to safely transit their vessels through the channel. Therefore, maintaining the authorized 27 foot channel depth is essential for these ships to safely transit from the BIW facility to sea.

Barge based mechanical dredges such as clamshell and bucket types are not as efficient as a hopper dredge for this type of work. A hopper dredge is more suitable for this work because it typically dredges while moving against the current, taking advantage of river conditions rather than opposing them. Use of a hydraulic dredge (that would require a floating pipeline) would not be appropriate for this proposed work because of the swift river conditions and weather conditions, especially at the mouth of the river.

3) Modifications of the Proposed Disposal

Riverine or open water disposal has been previously evaluated (1980, 1981, 1986, 1989, 1991, 1997, 2000, 2002 and 2003) as the most environmentally acceptable site, given the cost sharing and operational constraints involved with the use of material for direct beach nourishment. The use of the material dredged for beach nourishment would involve local cost sharing. The involvement of local cost-sharing was declined by the state and local municipalities in 1980, 1986 and 1989. The use of the riverine site maintains the supply of downriver transported sand for the Kennebec River sand budget. Evaluation of hydrographic surveys conducted in 1981 and 1982, before and after disposal, shows that most of the impacts from disposal are confined to the actual 500 foot disposal site and to an area no more than 500 feet around the site one month after disposal (see Appendix 1). The movement of the sand from the shoal areas at Doubling Point to the Bluff Head disposal site three kilometers downstream does not constitute a major alteration in the overall sand budget of the Kennebec River (see Affected Environment).

The proposed in-river disposal site north of Bluff Head has previously received sandy material, as described in Table 1. Results of these disposal activities have not identified any significant adverse environmental impacts associated with continued use of the site (see section F.2. of this assessment). The continued use of this site for the disposal of sand is the preferred alternative over the establishment of any additional riverine dredge material disposal sites in this estuary. The continued use of this site does not dedicate any additional areas to periodic disturbance from dredge material disposal.

The only disposal options economically feasible for use with a hopper or mechanical dredge are: riverine, nearshore, and open water. The use of the upstream disposal area off Bluff Head for the shoals downstream near Popham Beach is impractical due to the additional time and distance required to travel upstream. It is expected that the material disposed near the Bluff Head disposal site will eventually travel downstream. Material placed at the Jackknife Ledge disposal site is expected to remain in the littoral system and potentially re-nourish nearby beaches.

Open water disposal was used in 1971 when the river mouth was dredged by the hopper dredge COMBER. This method is economically acceptable but does not keep the material in the littoral system.

Most contract dredges and the Government owned hopper dredge McFarland, are, under certain conditions, capable of pumping out the loaded hoppers. The material is pumped through a pipeline for disposal directly to a confined disposal area or beach nourishment project. To operate in this manner additional time, equipment, and personnel are required. A tie-up barge and sufficient pipeline to reach the disposal area must be mobilized and set up. The only available disposal site for this method is at the river mouth. The additional cost of equipment, and personnel would be a non-Federal expense.

Upland disposal is a viable alternative if a suitable site could be identified and a non-Federal sponsor could be found to fund the increased cost for disposal. The dredged material is composed of clean sand and disposal of the material at an upland site would remove it from the sand budget in the riverine/beach system if an upland site were used. Corps policy encourages beneficial use of dredged material so this alternative was not considered further.

E. Affected Environment

1) Dredging Site

a) General

The proposed dredging activity will remove sand shoals from the Federal navigation channel in the Kennebec River. This activity will often occur in an area near Doubling Point (see Figure 2). Sand will be removed from a shoal area near Doubling Point and near Popham Beach.

b) Physical and Chemical Environment

The current flow in the Doubling Point area of the Kennebec River (Figure 2) has north/south orientation that is abruptly shifted 90 degrees east across Fiddler Reach for 4,500 feet then south (180 degrees) through Bluff Head. At the Doubling Point area, the Winnegance Creek marsh system is supplied by riverflow southwestward from Hospital Point. The semidurinal tides in this region flood to a mean depth of 6.4 feet running 300 degrees northwest by west at a maximum of 2.6 knots and ebbing 127 degrees southeast by east at 3.0 knots (N.O.A.A., 1999). High and low water occur approximately one hour after the tide at the river mouth.

Water movement in the vicinity of the Popham Beach dredging area reflects the riverine outwash nature of this coastal constriction. Tidal range here (43 degrees 45'; 69 degrees 47') has a mean tide range of 8.4 feet and a spring tide range to 9.7 feet (N.O.A.A., 1996). Maximum flood tides run 332 degrees at 2.4 knots while maximum ebb tides run 151 degrees at 2.9 knots.

The project site is an estuarine system exhibiting classical "salt-wedge" layering with seasonal salinity variations (approximately 10-20 ppt) (Mitchell, 1967). The freshwater outflow of the Kennebec River is a result of the seasonal runoff from rain and snowmelt. The influx of salt water reverses the outflow causing an approximate six-foot tidal flux. The physical properties of fresh water make it less dense than saltwater and, as the outflow of freshwater encounters the saline influx a layering effect (halocline) occurs. The intrusion of saltwater is greater along the bottom of the river and the outflow of freshwater is strongest at the surface. The mixing and dilution along the salinity gradient is therefore oblique and hence the term "salt wedge." The extent, range and concentrations for the salt wedge are dependent on lunar cycles, precipitation levels and other meteorological conditions. The salt wedge has been identified as extending seven kilometers upstream of the project area, classifying the riverine dredging site as estuarine.

Appendix 2 lists the measurements made on May 1 and 2, 1986 of Kennebec River water chemistry determinations. These measurements depict a riverine/estuarine interaction. The spring season is typified by increased freshwater runoff. The results reflect a dominance of riverine influence at this upstream area from the proposed dredging. The biota in the vicinity of the upstream river project area (both dredging and disposal) is estuarine. The Popham Beach dredge area and the Jackknife Ledge disposal site are characteristically more marine.

Saline intrusion does occur through and above the dredging and disposal area. In May of 1986, the river water was measured as having an 11.5^0 Celsius to 14^0 Celsius range in temperature. Salinity was measured north of the project as 3.5 ppt maximum in the shallows. The "salt wedge" or deep cold water saline layer, can be expected to be greater than 3.5 ppt in the deeper river areas. Dissolved oxygen concentrations reflected some net oxygen consumption, but generally approached saturation, ranging from 9.6 ppm to 9.9 ppm. Secchi determinations identified riverine silt load contributing to turbidity with measurements of 1.75 to 3.25 meters.

Appendix 2 also lists the low-tide water chemistry profile performed at the proposed Jackknife Ledge disposal site on July 6, 1989. Water column temperature ranged from 11.5^0 Celsius on the bottom to 15^0 Celsius at the surface. Dissolved oxygen was generally supersaturated at 11.5 ppm near the bottom and 9.2 ppm one meter below the surface. Secchi depth averaged about nine feet (2.75 meters).

The water quality classification for Merrymeeting Bay between Abagadasset Point and Chop Point in the Kennebec River is presently Class B. Class B waters are the third highest classification and shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as specifically prohibited; and navigation; and as habitat for fish and other aquatic life. Discharges to Class B waters shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

The tidal waters of the Kennebec River are classified as SA. Class SA waters are the highest rating for estuarine and marine waters. This classification applies to waters which are outstanding natural resources and shall be preserved because of their ecological, social, scenic, economic or recreational importance. These waters are also suitable for recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish and navigation, and as a habitat for fish and other estuarine and marine life. The habitat shall be characterized as free-flowing and natural (Title 38, Maine Revised Statues).

Grain size analysis of the dredged material has been performed in 1971, 1977, 1979, 1986, 1988, 1989, 1991, and 1995, and 2010 (see Appendix 3). The results of this testing has always shown the material to be sand, usually medium or medium to fine grained; sometimes with traces of silt and/or gravel. This material is a result of the current scour that prohibits settling of fine grained silts and clays. Chemical analyses were not performed on the proposed material due to the absence of any sediments containing more than 15% fines (silt/clay). Chemical contaminants are not expected to adsorb to the coarse particles and the well scoured nature of the substrate would disallow any significant chemical buildup. In addition, there are no significant sources of contaminants located in the vicinity of the proposed dredging.

In 1980 through 1982 extensive hydrographic surveys (S.A.I.C., 1984) were conducted in the proposed upstream dredging area to document the formation of sand waves and the effects of dredging. The analysis of the bathymetric changes describes the substrate of the Kennebec River as a highly dynamic system. The dredging of the Doubling Point region adequately removed the shoals, but preliminary surveys four months after dredging indicated the reformation of some sand shoals shallower than the 30 foot isobath. The channel dimensions that are authorized for the entire Kennebec River to Bath, Maine, require dredging to maintain a 27 foot depth. The 1981 dredging overdredged the substrate to 33 feet in an attempt to reduce the dredging frequency. Shoaling in this area confirms the Kennebec River substrate to be a dynamic system of sand movements with currents and tides as the controlling vectors.

The Hunnewell and Popham Beaches adjacent to the shoal west of the Sugarloaf Islands have historically undergone drastic episodes of erosion and accretion. Historical file photographs document a changing shoreline. Local residents confirm these phenomenae and have indicated numerous cottages built on the dunes have either been lost or moved inland over the past five years.

c) Biological

The Kennebec River is a complex estuarine system draining Sagadahoc County below Merrymeeting Bay. The area has extensive salt marshes dominated by *Spartina patens* and *Spartina alterniflora*. Along the river reaches sand flats occur with productive shellfisheries (*Mya arenaria*) and worm (*Glycera* and *Nereis* spp.) habitat. The area immediately adjacent to the dredging activity and disposal sites is undeveloped marsh and shoreland.

The shorelands along the Kennebec River in the vicinity of the upriver dredging and disposal sites were predominantly forested dominated by eastern white pines, *Pinus strobus* and hemlock, *Tsuga canadensis*. The banks of the river consisted of vertical cliffs of approximately 10-20 feet in height. The intertidal slope at the base of these cliffs formed narrow bands of marsh and rocky/sandy crevice areas with algal growth. The marsh was generally less than 30 feet wide. The shoreland border of the marsh band was dominated by the common reed *Phragmites australis*, transitioning to spike grass *Distichlis spicata* and high marsh, and then to cord grass, *Spartina alterniflora* (257.3 culms/square meter) border above the algal covered rocks in the low intertidal areas (see Appendix 2 - Biological Report).

The rocky intertidal area, sampled at Station 1 (see Appendix 2) was dominated by the amphipod *Gammarus lawrencianus* (2,309.2/square meters) inhabiting the algal cover of the rock and sand filled crevices. The dominant algae was the rockweed *Fucus vesiculosus*. Additionally, some sea lettuce *Ulva lactuca* and some hollow green weeds *Enteromopha intenstinalis* were present. The algal cover with its associated crustaceans are probably significant forage at flood tides for river finfish.

Station 2 (see Appendix 2) was located on a crescent shaped intertidal sandy-mudflat. This area graded from shoreland to marsh to mudflat over a 50 meter shelf. The mudflat was dominated by the bivalve *Mya arenaria* (24.9/square meter) called the softshell clam, and the polychaete *Nereis virens* (24.9/square meter), the clam worm.

A sand shoal has formed in the Federal navigation channel in the vicinity of Popham Beach. Shorelands in the immediate area include typical Maine rocky intertidal and sandflat (beach) habitat. Dense algal mats (*Fucus* and *Ascophyllum* spp.) and rocky crevices provide a diverse niche for numerous species. The shoreland is an intertidal beach.

2) Disposal Sites

a) General

The disposal of material dredged from the Doubling Point region will occur at an in-river site 2,500 feet north of Bluff Head (Figure 2). The site is about two miles downriver of the proposed dredging site. A hopper dredge will make hourly discharges at the site, emptying between about 1,200 and 3,140 cubic yards of sand each trip.

Dredged material from the Popham Beach (downriver) area of the Federal channel will be disposed south of Jackknife Ledge. In the past no time restrictions for shortnose sturgeon exised for this area, and most likely this area would be dredged as the same time as the upstream area. However, recent tagging data has shown a movement of Kennebec River shortnose sturgeon from the Kennebec to the Penobscot River, so it is possible that during the times of dredging sturgeon may in this area as well moving to or from the Penobscot River, northeast of the Kennebec River.

b) Physical and Chemical Environment

The water flow at the upriver disposal site is directed north and south with a maximum flood of 2.5 knots (133.7 cm/sec) and maximum ebb of 3.0 knots (154.3 cm/sec) (N.O.A.A., 1999). The disposal area is estuarine with salinities varying (10-20 ppt) with river runoff (Mitchell, 1967). The water quality classification in this section of the river is the same as the dredge site, SA (see Section E1). The disposal site is located in water averaging 73.8 feet (S.D.=4.1m), and is 500 feet wide by 500 feet long with a maximum depth of 93.5 feet.

Analysis of two hydrographic surveys, one before the 1981 disposal and one after, define the site as a dynamic area (see Appendix 4). Most of the dredged material was found to be confined to the disposal site and 500 feet downstream, one month after disposal. The sand substrate is indicative of the dynamic equilibrium that a high energy system attains (see Section E.2.).

The disposal site south of Jackknife Ledge was selected by the Maine Department of Environmental Protection - Geological Survey Unit because they believed that the dredged sands would be retained in the nearshore system. Appendix 4 describes the results of the 1989 sidescan sonar survey of the site. Fitzgerald and Fink (1987) describe the cyclic nature of the sand budget for this area. Their study concludes that the glacially deposited beach is renourished by a sediment gyre. Wave action moves sediments easterly along the beachfront to be transported into the Kennebec River by flood tidal and wave energy. The rivers ebb delta brings the sand back seaward to be reworked onto the beach face. The disposal area was situated to take advantage of the sediment gyre so a potential exists for sands to be reworked onshore.

c) Biological Environment

The upriver disposal site is located in a deep water hole within a fast three knots (154.3 cm/sec) flowing river. The organisms inhabiting this disposal area can be anticipated to be able to exploit a dynamic environment. Anadromous and catadromous finfish are transients of the site (see Section 4, Ecologically Significant Species) moving through the area to seasonal spawning habitat. The riverine habitat, in general, is the same as described for the dredging site (see Appendix 2).

The nearshore disposal site is in an area of strong wave influence. Benthic species adapt to shifting sands that form among ridges and gullys of rock. Seasonal lulls of storm activity allow benthic fauna to colonize this area. Storm action may overturn the bottom which reinitiates the colonization cycle.

The benthic community of the nearshore disposal site for the Kennebec River dredged material was dominated by organisms adaptive to shifting sands. On a community level, the species guilds represent colonization stages of pioneering organisms on disturbed substrates. Storm activity and littoral processes most likely perpetuate this type of pioneering community.

The average sampling results define a community of 36 species with a density of 18,350 organisms per square meter. The community was dominated by pioneering organisms of the Oligochaete sp. (27.8%); and the polychaetes *Prionospio steenstrupi* (22.2%) and *Capitella* sp. (11.6%) representing 61.6% of all organisms. The bivalve *Nucula delphinodonta* (9.6%), a small clam called the "nut clam", and the predatory polychaete *Africidea catherinae* (8.6%) were also abundant. The top ten numerically dominant species comprised 91.3% of all organisms.

This community type is probably the result of winter storm disturbance of the substrate and subsequent recolonization of benthos. The spring recruitment of less dominant species and the low energy of summer storms potentially accounts for the high number of species (36). This type of community will quickly recolonize any disturbed area if the grain size after disturbance is not excessively different.

3) Threatened and Endangered Species

The proposed maintenance dredging project will occur in the Doubling Point and Popham Beach areas of the Kennebec River. The piping plover *Charadrius melodus*, a Federally listed threatened species and state listed Endangered species, is known to nest on Popham Beach. Common terns, *Sterna hirundo* a federally listed species of concern (FWS http://www.fws.gov/endangered) nest on Pond Island, which is a component of the Petit Manan National Wildlife Refuge, and the nearby Sugarloaf Islands. Common terns have begun to nest on Pond Island since the control of gulls by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife letter dated October 8, 1997 and March 15, 2002). Both of these islands have supported a nesting colony of the federally and state endangered roseate tern *Sterna dougallii dougalli* in the past, although roseate terns have not been present in the past few years. It is anticipated that the roseate terns, will recolonize Pond Island and Sugarloaf Island once common terns have established a colony. Least terns *Sterna antillarum*, a State endangered species, have nested on Popham Beach also. According to the Maine Endangered Species Program, piping plovers and least terns are sensitive to disturbance during their nesting season. Generally this is between May 1 and August 31 but may vary slightly from year to year.

The area of the proposed project is a known seasonal corridor for the anadromous migration of the shortnose sturgeon *Acipenser brevirostrum*, a federally endangered species.. Coordination of this project with the National Marine Fisheries Service (NMFS) identified the proposed upriver dredging and disposal sites as being seasonally used as sturgeon habitat. A Biological Assessment and Biological Opinion for shortnose sturgeon was prepared in April 1997, and on August 28, 1997, respectively (see Appendix 5). In addition, a Biological Opinion for shortnose sturgeon was prepared on January 14, 2004 for the September 2003 emergency dredging of Doubling Point and Popham Beach.

It should be noted that the proposed project is also a seasonal migration corridor for the Gulf of Maine Distinct Population Segment of Atlantic salmon *(Salmo salar)*. This anadromous species migrates upstream in the spring to spawn in the freshwater tributaries and sections of the mainstem of the Kennebec River. During these upstream migrations, spawning adults will need to pass first through the Popham Beach area, and then through the Doubling Point area in order to access their spawning habitat. In the spring downmigrating smolts will also pass through these areas, and in the fall, post spawning adults returning to sea will move downstream through these same areas en route to the ocean.

The shortnose sturgeon, was identified as an endangered species in 1967 by the U.S. Fish and Wildlife Service (32 FR 4001, 11 March 1967). With the passage of the Endangered Species Act of 1973 (and as amended, 16 U.S.C. 1531 et seq.) it became unlawful to take or possess shortnose sturgeon. In 1974 the National Marine Fisheries Service assumed jurisdiction over the species (30 FR 41367-41377). Various studies (McCleave, et. al., 1977; Taubert and Reed, 1978; Squires and Smith, 1979; Dadswell, 1979; Taubert, 1980; and Dadswell, 1984) have analyzed the life history of the species. A petition (listed in the Federal Register on October 16, 1996) by the Edwards Manufacturing Company to remove the shortnose sturgeon in the Kennebec River from the List of Endangered and Threatened Wildlife (50 CFR 17.11) was denied by the NMFS. NMFS concluded that available data was insufficient to warrant designating individual populations in the Androscoggin and Kennebec River as distinct population segments under the Endangered Species Act.

The shortnose sturgeon forages primarily on insects, annelids, finfish, molluscs and crustaceans, frequenting shallow waters and seldom exceeding 135 cm in standard length

(McCleave, et. al., 1977) with life spans of 50 years (Boreman, et. al., 1984). Tracking of the daily movement of this species identified extensive use of 1-2 meter depths for foraging. Mean swimming speed ranged from 8.1 to 34.0 cm/sec, with orientation predominantly with or against the tide. Additionally, McCleave et. al. (1977) documented the euryhaline tolerances of this anadromous species, traversing salinity gradients fluctuating 10 ppt in less than two hours.

Shortnose sturgeon females spawn only once every three years (Boreman, 1984). The eggs are released and hatched in freshwater above the saline tidal influence. The eggs are demersal (adhered to the substrate) and juveniles nurture in freshwater until approximately 45 cm. Juveniles (and larvae) are benthic, occupying deep (greater than nine meters) areas of strong (15-40 cm/sec) currents in the river. Once adult size (45-50cm), the fish commence fall downstream and spring upstream migratory behavior. Some of the spring spawning adults may not migrate, but overwinter in deep, freshwater holes upstream of the tidal range near their spawning grounds. The remaining populations spend the winter in 30 to 100 foot deep (10-30cm) saline areas (Dadswell,1984) and the summer in low current, shallow 6 to 30 foot (2-10m) areas.

These organisms have been found to be nocturnal, foraging the shallows, usually spending daylight in deep water. Substrate preferred for forage includes shallow, muddy bottom in freshwater areas and gravel-silt bottoms 15 to 45 feet (5-15 meters) deep in saline areas. Juveniles (remaining upriver in freshwater) may prefer sand or gravel (high current) areas (Dadswell, 1984).

The adult population in the Kennebec River has been estimated at 7,222 based on tagging and recapture efforts from 1977-1981 (NOAA Letter dated September 29, 2003). Since that time additional tagging studies have been conducted, and the population has appeared to have increased. Based upon the mark and recapture data from 1998-2000 the estimated populations was approximately 9,488 fish with a 95% confidence interval ranging from 6942 to 1,3358 fish (Squires, 2003). This represents greater than a 20% increase in the population since the previous study in 1981. However, this does not include an estimate of the juvenile population. This species is discussed further in the "Biological Assessment For Shortnose Sturgeon (*Acipenser brevirostrum*) And The Gulf of Maine Distinct Population Segment of Atlantic Salmon (*Salmo salar*) in the Kennebec River, Bath, Maine" (Appendix D).

In 2000, the National Marine Fisheries Service and the U.S. Fish and Wildlife Service listed the Gulf of Maine (GOM) Distinct Population Segment (DPS) of anadromous Atlantic salmon (Salmo salar) as an endangered species. The GOM DPS includes all naturally reproducing wild populations and those river specific hatchery populations of Atlantic salmon having historical, river specific characteristics found north of and including tributaries of the lower Kennebec River, to, but not including the mouth of the St. Croix River at the United States-Canada border. The Penobscot and its tributaries downstream from the site of the Bangor Dam are included in the range of the GOM DPS (65 FR 69459; November 17, 2000 as cited in 71 FR 66299, November 14, 2006). At that time, a decision to include the salmon that inhabited the main stems of the Kennebec River above the former site of the Edwards Dam and the Penobscot River above the former site of the Bangor Dam was deferred by the Fish and Wildlife

Service and the National Marine Service pending genetic analysis of those populations. The upper Kennebec River and upper Penobscot River stocks were added in 2009.

Atlantic salmon are an anadromous species that historically inhabited the North Atlantic Ocean and its freshwater tributaries, ranging from Ungava Bay in Canada, to the White Sea in Russia. In eastern North America, they ranged as far south as Long Island Sound. Atlantic salmon in Maine were historically found in all of the major river systems and their tributaries which had suitable habitat. Atlantic salmon spawn in freshwater rivers and tributaries (in the fall), where they generally will spend 2-3 years before undergoing a physiological change (i.e. smoltification) and then migrate to the ocean (in the spring of the year). After spending 2-3 years in the ocean, they will return to their natal rivers in the spring to spawn again and complete their life cycle. Atlantic salmon can spawn more than once, and once spawning has occurred, post spawning adults may either remain in their streams or return to the ocean to repeat the migration cycle. Further discussion of the life history of this species can be found in the document " Biological Assessment For Shortnose Sturgeon (*Acipenser brevirostrum*) And The Gulf of Maine Distinct Population Segment of Atlantic Salmon (*Salmo salar*) in the Kennebec River, Bath, Maine" (Appendix 5).

4) Ecologically Significant Species

The Kennebec River is an important corridor for migratory movements of various species of fish. The project area is in the estuarine section of the river. The biota in the deepwater areas of Maine's estuarine rivers is not well described. Various species exhibit seasonal utilization of the estuary including alewife, *Alosa pseudoherengus*; American eel, *Anguilla rostrata*; Atlantic salmon, *Salmo salar*; Atlantic sturgeon, *Acipenser oxyrhynchus*; blueback herring, *Alosa aestivalis*; American shad, *Alosa sapidissima*; shortnose sturgeon, *Acipenser brevirostrum*; rainbow smelt, *Osmerus mordax*; striped bass, *Morone saxatilis*; and lobster, *Homarus americanus*.

The American shad, *A. sapidissima*, move through the estuary in the spring, spawn and return before summer's end. The juveniles follow before fall ends. Rainbow smelt, *O. mordax*, move upriver in the /early spring to spawn, during the spring high water run-off and the young quickly leave the upper tidal section shortly after hatching. The adults return to the ocean shortly after spawning (http://www.link75.org/mmb/cybrary/kenfish/krfish.html).

The striped bass, *M. saxatilis*, enters the freshwater upriver in the summer and leave in the fall. The alewife, *A. pseudoherengus*, moves upriver in the spring to spawn and returns through summer to the marine environment. The juvenile would swim seaward during the fall.

The American eel *Anguilla rostrata* is a catadromous organism, spawning in the offshore marine environment. The adults move seaward through the estuary during the fall and juveniles return in the spring.

The Atlantic salmon move upriver in the spring, to breed in the fall , returning to the marine environment in early winter. After spending approximately two years in freshwater, the juveniles migrate to sea in the spring. The shortnose sturgeon moves upriver to spawn in the spring through summer (see Endangered Species). Adults return through the project area in the fall to overwinter in the deeper waters near Merrymeeting Bay . The Atlantic sturgeon has a greater abundance than the shortnose sturgeon especially in more saline waters. The adult Atlantic sturgeon move upriver in April through June, spawning and returning to the estuary in late summer to early fall. The juvenile also return seaward in late summer. The blueback herring moves upriver in spring and downriver in summer. The juvenile follow seaward in fall.

American lobster move into the lower Kennebec River estuary in spring/summer. They begin movement to deeper waters offshore in fall. Coordination with local fishermen indicate lobsters will have left the project area by the end of October. Spring returns will start during early May.

The restoration of anadromous fish runs and the maintenance of high water quality in the Kennebec River also serve to enhance the habitat of the bald eagle, *Haliaetus leucocephalus* which was recently delisted both federally and statewide from endangered status. This raptor occasionally forages the Maine coastal areas such as the estuarine region of the Kennebec River. North of the project site approximately 15 eagles have been observed in Merrymeeting Bay. The State has on occasion sponsored a feeding program to enhance the nesting population. Historical nests have been located near Swan Island and Hacamock Island, but no nesting activity is known to occur within the project area (Ron Joseph, USFWS - Personal Communication). Since the removal of the Edwards Dam, many anadromous and resident fish have unimpeded access to the base of the Lockwood Dam in Waterville, which would also increase the habitat of many other piscivorous avian species including eagles as well as ospreys.

5) Historic and Archaeological Resources

Due to the repeated dredging of the Federal navigation channel in the Kennebec River and the previous use of the riverine disposal site south of the dredging area, the potential for the presence of any historic properties is very low. There are no known historic shipwrecks in the vicinity of the proposed disposal site near Jackknife Ledge.

6) Social and Economic Resources

Two-thirds of the population (approximately 10,000 employees) in the city of Bath is dependent on shipbuilding as their income (Veazie, 1979), and is directly dependent on the proposed maintenance dredging project to continue operation. Large container vessels and deep draft U.S. Navy vessels are manufactured and repaired at the Bath facility. The Bath Iron Works relies upon extreme high tides to move U.S. Navy Destroyers. The delay of vessel traffic through shoaling in the project area impacts construction and repair processes.

Air Quality

Ambient air quality is protected by Federal and state regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

In 1997, the EPA established a new 8-hour ozone standard and in which was implemented in April, 2004 . With the implementation of this 8-hour ozone standard, in September 2005, the EPA revoked the previous 1-hour non- attainment ozone standard for most of the United States. Sagadahoc County Maine, which was previously classified as a moderate non-attainment area under the 1 hour ozone standard, as of June 15, 2005, is no longer subject to the 1-hour ozone rule but is now listed as an ozone Maintenance area under the 8 hour ozone standard. (http://www.epa.gov/airquality/greenbk/oindex.html#List2).

F. Environmental Consequences

1) Dredge Site

a) General

The impacts of dredging sand from the project areas will be limited to turbidity increases, loss of habitat, and removal of organisms. These impacts are expected to be both spatially and temporally limited. Dredging will occur only within the designated Federal channel (see Figure 1). Dredging will be completed between Approximately August 1 and August 30 for the Doubling Point area and Popham Beach area.

b) Physical and Chemical Effects

The substrate at the Doubling Point region of the Kennebec River is in a dynamic flux of shifting sands. Dredging removes sand that has formed irregular sand waves with crests above the project depths. Surveys (S.A.I.C., 1984) have defined the formation of these sand waves within four months after dredging. The site undergoes daily volume changes (S.A.I.C., 1984). These total volume changes and sand waves are a result of hydrodynamic forces of riverflow and semidurinal tides. The total volume of sand does not increase appreciably, but the sand wave formation occurs rapidly. These phenomenae are indicative of fast currents reacting to the tidal cycle and to the 90 degree shift in direction at Doubling Point.

The Popham Beach dredging area is a spillover area for sands in the Popham Beach sediment gyre. Removal of the shoal will not appreciably change the sand budget since the disposal site was selected to retain the sand within the gyre. Local concerns for increased dune erosion resulting from maintenance of authorized channel depths have been reviewed with State agency experts. It is unlikely that removal of these small shoals will contribute to significant erosion of the beach.

The water quality at the dredge site is not expected to be appreciably degraded during dredging operations. As the dragarm is moved, some sand will be displaced. The turbidity associated with sand dredging is minimal since sand settles rapidly. The grain size curves (see Appendix 3) for the dredge sites reveal all the sediment to be sand. Secchi determinations (see Appendix 2) during recent surveys determine the river to have a high background turbidity (Secchi 2-2.5m) during the tidal cycles. The dredging of sand will not impact organisms inhabiting this silt-turbid river.

A hopper dredge will fill the hoppers with a slurry of sand and water in approximately a one to four ratio. As stated earlier, the river environment is dynamic and its inhabitants are adaptable to turbidity, shifting sand and other natural stresses associated with fast currents. Turbidity associated with spring runoff and winter storms would have a greater impact than this sand resuspension from hopper overflow since runoff and storms will input silt into the river. A water quality monitoring study was conducted to meet the Water Quality Certification (WQC) conditions for the 1997 dredging and disposal activities at Doubling Point. The WQC conditions specified that bacterial levels be monitored just south of the Bluff Head disposal site immediately before and soon after disposal episodes, and that turbidity be monitored before and after disposal events at Bluff Head. The monitoring was conducted by Normandeau Associates and concluded that the "turbidity levels near Bluff Head dredging and disposal areas in the Kennebec River were low, before, during and after the November 1997 dredging. There was no apparent trend related to station, depth, or dredging/disposal. Fecal coliform levels were low with one exception, possibly related to the pre-dredge storm activity, which may affect runoff or WWTP function. There was no evidence of an increase related to dredging."

c) Biological Effects

The benthic organisms inhabiting the dredged material will be destroyed by the dredging operation. These areas have been previously dredged. The substrate will probably undergo larval and adult recruitment of organisms that will, within a few spawning seasons, result in the re-establishment of the pre-dredging benthic community.

The proposed August dredging of the Kennebec River Federal Channel, interference with the passage of various anadromous and catadromous fish will be minimized, since many of the upstream and downstream migrations have been completed Also, motile organisms will generally avoid the dredging operation when possible. However, it is likely that the endangered shortnose sturgeon may be in the vicinity of Doubling Point during that time. In the 2003 emergency dredging of Doubling Point a total of 5 shortnose sturgeon came in contact with the dredge, with the assumption that three of those interactions (takes) resulted in fish mortality. The effects of the proposed dredging on shortnose sturgeon will be discussed further in Section F. 3 of this EA.

No other significant adverse biological impacts are anticipated to be associated with the dredging of sand.

2) Disposal Site

a) General

The disposal of sand at the in-river disposal site and at Jackknife Ledge during a two week to two month period will bury those organisms inhabiting the disposal sites, entrain organisms in the water column during disposal, and possibly temporarily disrupt fish movement.

b) Physical and Chemical Effects

Analysis of the bathymetric surveys of previous disposals at the upriver site (see Appendix 1) has shown that the sand remains predominantly within the disposal area. After one month, the effects of disposal are evident onsite and 300 meters downstream. This agrees with calculations based on particle size, a fast river flow of 12,000 cfs, and a depth of 86.5 feet (including mid-tide) at the disposal site for determining where deposit of the material would occur. Based on these calculations, about 90% of the dredged material would settle out within 3,000 feet downstream of the in-river disposal site. Using a comparison of bathymetric means (calculations are included in Appendix 4), most survey areas exhibited fluctuations in average depth over a 10 month time span. This fluctuation is reflective of the dynamic nature of the river bottom.

The movement of sand through the water column will be an occasional and short-lived phenomenon. All material to be disposed will quickly settle through the water column. River bottom currents will also move the sand, to some extent, until it reaches equilibrium with the Kennebec River's normal sand budget. Disposal off Jackknife Ledge is considered by the State of Maine to be a beneficial use of the dredged material compared to disposal at the previously use offshore site. The retention of the sands within the local sediment budget represents a minimal impact to the overall system.

Dredging operations cause sediment to be suspended in the water column. This results in a sediment plume in the river, typically present from the dredge site and decreasing in concentration as sediment falls out of the water column as distance increases from the dredge site. Water quality studies conducted using a mechanic dredge in the vicinity of the Bath Iron Works (upstream from the proposed project at Doubling Point) by Normandeau Associates in 1997 and 2001 indicate that this is a naturally turbid area with naturally occurring fluctuations in turbidity. In 2001, Normandeau Associates monitored water quality during dredging operations at Bath Iron Works. Pre-dredge total suspended solids (TSS) levels ranged from 20-49 mglL. The maximum observed TSS levels during and after dredging was 55 mglL. This level was recorded during an ebb tide, 50 feet from the dredge. Additional monitoring was conducted during dredging at the Pier 2 berthing area in 2002. Pre-dredge turbidity ranged from 5.0-7.9 NTU with TSS values ranging from 12 -18 mglL. During dredging, TSS ranged from 24 to 43 mglL. While increased turbidity was experienced at a distance of 150 feet from the dredge, the highest concentrations were limited to the area within 50 feet of the dredge (2009 BO, page 46).

Monitoring of twelve mechanical dredge operations in the Delaware River (Burton 1993) in 1992 indicated that sediment plumes have fully dissipated by 3300-feet from the dredge area. The Delaware River study also indicated that mechanical dredging does not alter turbidity or dissolved oxygen to a biologically significant degree and analysis did not reveal a consistent trend of higher turbidity and lower dissolved oxygen within the sediment plume.

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580 mg/L to 700,000mg/L depending on species. Sublethal effects have been observed at substantially lower turbidity levels. For example, prey consumption was significantly lower for striped bass larvae tested at concentrations of 200 and 500 mg/L compared to larvae exposed to 0 and 75 mg/L (Breitburg 1988 in Burton 1993). Studies with striped bass adults showed that prespawners did not avoid concentrations of954 to 1,920 mg/L to reach spawning sites (Summerfelt and Moiser 1976 and Combs 1979 in Burton 1993). The Normandeau 2001 report identified five species in the Kennebec River for which TSS toxicity information was available. The most sensitive species reported was the four spine stickleback which demonstrated less than 1% mortality after exposure to TSS levels of 100mg/L for 24 hours. Striped bass showed some adverse blood chemistry effects after 8 hours of exposure to TSS levels of 336mg/L. While there have been no directed studies on the effects of TSS on shortnose sturgeon, shortnose sturgeon juveniles and adults are often documented in turbid water and Dadswell (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters.
As such, shortnose sturgeon are assumed to be as least as tolerant to suspended sediment as other estuarine fish such as striped bass. (page 46 of Bath Iron Works, 2009 Biological Opinion from NMFS).

It should be noted that these studies were done with a mechanical dredge, and not a hopper dredge as will be used for this proposed project. However a hopper dredge will take less time to complete the job, so any associated turbidity impacts will be for a shorter duration.

c) Biological Effects

Two concerns were raised by commercial shellfisherman during a public hearing held in Phippsburg, Maine on October 9, 1997 regarding the dredging and disposal of material at the Doubling Point area. The first concern was that disposal of material at Doubling Point would cause siltation of softshell clam flats located downstream. The clam flats are located in Drummore Bay, near Parker Head, in Wyman Bay, and Atkins Bay. The second concern was that the disturbance of dredged material would increase the fecal coliform levels in the water causing the flats to be closed to shellfishing.

Discussions in the previous section show that the disposal of material at the in-river disposal site would settle out before reaching the tip of Bluff Head. The tip of Bluff Head is located almost one and a half miles north of the nearest clam flat of concern (Drummore Bay). Based on the type of material to be dredged (sand vs. silt), and the distance of the disposal site from the clam flats, no sedimentation from dredging and disposal activities is expected. This is further confirmed by a previous investigation (Larson, 1982) which analyzed the downriver sedimentation rates on five commercially viable intertidal clam flats. Alterations of sediment characteristics on these intertidal flats would correspondingly alter the indigenous biota. Each flat was measured at upper and lower intertidal stations three days prior, through one week after dredging and disposal (October 5 through November 4, 1981). A total of six temporal measurements at ten stations exhibited a decrease in sediment depth, not an increase. This substrate fluctuation represents the dynamic nature of the Kennebec River bottom. The study did not identify any relationship between dredging or disposal of dredged material and sedimentary alterations on the Kennebec River clam flats.

Also, it might be expected that the amount of material carried downstream by the Kennebec River from upland sources during spring runoff would be several orders of magnitude greater than the amount of dredged material deposited near Doubling Point. If sedimentation of the clam flats is not observed during the spring runoff period, then it is even more unlikely that disposal of dredged material would cause sedimentation of the flats.

Concerns about increased fecal coliform levels can be partly addressed by the type of material to be dredged. Contaminants, including bacteria, do not generally adhere to sand particles due to the structure of sand. Recent investigations for the proposed Providence River maintenance dredging project showed that based on the following tests, coliform would not be a concern in Providence and should be less of a concern in the Kennebec River. Samples taken from Providence River were predominantly fine-grained muds (>85% silt-clay), which would be expected to produce coliform levels higher than those likely to occur in Kennebec River. In addition, Providence River is influenced by sewage treatment plant effluent, combined sewer outfalls, riverine input and non-point pollution sources. Sediment samples were taken from both the top of the sediment column and the fluff layer just above the sediment. Total coliform levels in the fluff layer were 390 to 9300 per milliter. Levels observed in the sediment were 93 to 390 per milliter. Using the highest (i.e. worst case) coliform level, 9300/ml, three orders of magnitude reduction in the initial value (to 9.3) would be necessary to eliminate concern, based on a standard of 15 MPN (most probable number of coliform bacteria per 100/ml sample).

Based on extensive research and model development, it has been shown that this kind of dilution is quickly achieved within about a few hundred yards Further dilution (another one or two orders of magnitude) beyond this distance would also occur. As a result, any concern for resources located over a mile from the dredging and disposal sites should be minimal. Initial levels in the Kennebec River should be considerably lower than those observed in the Providence River. Therefore, any exceedance of the fecal coliform standard resulting from either dredging or disposal activities is extremely unlikely. This is supported by the 1997 dredging/disposal monitoring results conducted by Normandeau Associates and discussed above.

The clean sand being disposed is not expected to have any adverse impacts on adjacent biota. The benthic organisms that have colonized the site since the previous disposal operation will be buried. Re-colonization is anticipated to occur within a few seasons of larval and adult recruitment.

The turbidity plume resulting from the dredging operations, may create a temporary barrier to finfish inhabiting the active dredging area. However, it is expected that most motile pelagic and demersal finfish species will avoid the area of active dredging. It is possible that the endangered shortnose sturgeon which feed off the bottom may be entrained in the dragarms of the dredge if they are in the area during the dredging time frame This will be discussed further below the section on Threatened and Endangered Species.

3) Threatened and Endangered Species

It is likely that the proposed dredging may have an effect on the shortnose sturgeon in the Kennebec River. As noted previously, shortnose sturgeon have been known to occur in the Doubling Point area during the summer and early fall, and the October 2003 dredging of this area resulted in 5 takes, with 3 of them presumed lethal. At that time, the National Marine Fisheries Service issued a Biololgical Opinion on the emergency dredging operation and determined that the emergency action affected the Gulf of Maine DPS of Shortnose Sturgeon, but did not jeopardize it. It was also found that mortality of sturgeon taken by the dredge could be reduced by the removal of the protective screens on the intake, since two of the sturgeon that had been taken after the screens were removed were released with only minor injuries, and were therefore more likely to have survived. Therefore, although there may be interactions between the dredge and shortnose sturgeon possibly resulting in lethal takes, it is presumed that these would affect but not jeopardize the Gulf of Maine Distinct Population Segment of shortnose sturgeon.

Recent population studies have shown a greater than 20% increase in the Kennebec River shortnose sturgeon population (mentioned previously). Some of these studies have also shown that there is movement of the Kennebec River Sturgeon between the Kennebec River and the Penobscot River, located approximately 150 kilometers to the north east (Fernandes, 2008). In order to move to this location, the sturgeon would need to move out of the Kennebec River through the area of Popham Beach. Therefore, it is possible that shortnose sturgeon could be found in the vicinity of Popham Beach during the time of active dredging. However, as noted, the increased population of shortnose sturgeon would further reduce the likelihood that any incidental takes would jeopardize the shortnose sturgeon population. Prior to the proposed dredging event, the National Marine Fisheries Service will issue their Conservation Recommendations as well as an incidental take statement. The conservation recommendations include methods for reducing interactions with sturgeon or mortality of sturgeon should interactions occur. They also recommend and/or require that a trained observer be present on board the dredge in order to monitor for the presence and/or taking of shortnose sturgeon. Given the fact that there could be sturgeon near Popham Beach, it is possible that an observer be present in this location as well. Therefore although it is possible that shortnose sturgeon takes may occur during the August 2011 dredging, it is unlikely that these would cause jeopardy to the Gulf of Maine DPS of Shortnose Sturgeon in the Kennebec River. All conservation recommendations provided by the National Marine Fisheries Service will be adhered to during these dredging activities.

It is possible that terns may also be in the vicinity of Popham Beach during the time of the proposed dredging. As discussed previously, the U.S. Fish and Wildlife Service has been restoring nesting populations of common terns to Pond Island at the mouth of the Kennebec River, which is part of the Petit Manan National Wildlife Refuge with the goal of increasing the endangered Roseate Tern population. Roseate terns are expected to recolonize the island once the common tern population becomes established. Nesting season generally occurs from the middle of May through the end of August. Therefore it is possible that some of these birds could be nesting during the time of active dredging. However, coordination with the U.S. Fish and Wildlife Service will be conducted with recommendations adhered to. In addition, the distance of the dredge area from the nesting sites is approximately one half mile, and therefore this further reduces the likelihood of adversely affecting these nesting terns. Minimal impacts from turbidity on prey fish for the birds is expected.

It should be noted that the 2003 Biological Opinion note that the existing dredging window for shortnose sturgeon is between November 1 and March 30. However as noted the proposed dredging will occur in August, outside of that recommended dredging window.

Spawning of sturgeon will occur well above the project area in freshwater. Overwintering studies show adults moving to an area in Merrymeeting Bay, which is upstream of the project area. The Biological Assessment and Biological Opinion (see Appendix 5) state that dredging and disposal operations in the Doubling Point reach in November 1 through April 30 may affect, but is not likely to jeopardize the continued existence of shortnose sturgeon. A recent letter (November 29, 2000) indicated that a new dredge window of December 1 to March 1 is needed based on new information.

The proposed dredging is planned to occur in August, which is outside the recommended dredging window. Based upon past information, it is possible that shortnose sturgeon may be in the area. However, it should be noted that during the emergency dredging of Doubling Point which occurred in October of 2003, there were five shortnose sturgeon takes with three of them lethal. It was determined that these five takes may have affected but not jeopardized the shortnose sturgeon population in the Kennebec River.

In the 2002 Biological Opinion, the National Marine Fisheries Service has recommended a dredging window for the Doubling Point area from Novemeber 1 through March 30th of any year, . A take statement allowing the take of 4 sturgeon for any dredging event was also issued with this Biological Opinion (See Appendix D).

4) Ecologically Significant Species

Most most anadromous and catadromous species in the Kennebec River (see Affected Environment) are expected to actively avoid the dredging operations in the Kennebec River. Spawning of finfish and larval recruitment of benthos occurs primarily spring through summer.

5) Historical and Archeological Resources

The proposed maintenance dredging of the existing Federal navigation project in the Kennebec River in the Vicinity of Bath, Maine and the disposal of the dredged material near Jackknife Ledge and at the riverine disposal area north of Bluff Head, is unlikely to have an effect upon any structure or site of historic, architectural, or archaeological significance as defined by the National Historic Preservation Act of 1966, as amended. The Maine Historic Preservation Commission in a letter dated September 24, 1997 has concurred with this finding.

6) Social and Economic Resources

The maintenance dredging of the Federal channel is not anticipated to have any negative effects on social or economic resources. Positive effects for business would be accrued by maintaining the project. This dredging will allow the river traffic to operate normally, maintaining the accessibility of the Bath Iron Works shipyard to deep draft vessels.

The proposed maintenance dredging of the congressionally authorized federal channel is not expected to have a significant impact on minority or low income population, or any other population in the United States. Additionally, the project would not create a disproportionate environmental health or safety risk for children.

7) Essential Fish Habitat

The 1996 amendments to the Magnunson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning , breeding, feeding, or growth to maturity." Managed species listed for the 10' x 10' square of latitude and longitude which includes Kennebec River are: Atlantic salmon, Atlantic cod, pollock, whiting, red hake, white hake, winter flounder, yellowtail flounder, windowpane flounder, American plaice, ocean pout, Atlantic halibut, Atlantic sea scallop, Atlantic sea herring, bluefish, Atlantic mackerel, and bluefin tuna.

The following lists the managed species and their appropriate life stage history for the designated 10' x 10' square which includes the Gulf of Maine waters within the square within the Sheepscot River and Bay, Montsweag Bay, Hockomock Bay, Sasanoa River and the Kennebec River affecting the following: Isle of Springs, Boston Island, northwest Southport Island, Green island, MacMahan Island, northern Arrowsic Island, Doubling Point, Back River, Robinhood, Maine, Knubble Bay, Goose Rock Passage, Wesport Island, Young Point, Chewonki Neck, Phipps Point, Woolwich, Maine, Bath, Maine, Ram Island, northern Lee Island, Indian Point, Winsweag Creek, Burnt Jacket Channel, Lines Island, West Chops Point, and Chops Point.

Of the above species listed, the species that occur in the Kennebec River estuary (and their life stages) are as follows: Atlantic salmon (juveniles, adults), Atlantic cod (juvenile, adult), Atlantic herring (larvae, juveniles, adults), ocean pout (eggs, larvae, juveniles, adults, spawning adults), American plaice (eggs, larvae, juveniles, adults, spawning adults), pollock (juveniles), red hake (juveniles, adults), white hake (juveniles, adults), whiting (juveniles, adults), windowpane flounder (eggs, larvae, juveniles, adults, spawning adults), winter flounder (eggs, larvae, juveniles, adults, spawning adults), yellowtail flounder (eggs, larvae), bluefish (juveniles, adults), Atlantic mackerel (juveniles, adults), Atlantic halibut (eggs, larvae, juveniles, adults, spawning adults).

A description of the of the life histories of these species can be found in Appendix 6. No significant impacts to EFH habitat or the above EFH species is expected based on the following reasons. Dredging and disposal activities are not expected to impede the passage of fish migrating up and down the Kennebec River due to the width of the river. The material to be dredged is coarse grained (i.e. sand). This will limit the amount of turbidity in the river during dredging and disposal activities. *Coordination with the National Marine Fisheries Service is being conducted to avoid and minimize impacts to EFH species in the vicinity of the proposed dredging project.*

8. Air Quality

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA state implementation plans for geographic areas designated as non-attainment and maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) is found at 40 CFR Part 93. Clean Air Act compliance, specifically with EPA's General Conformity Rule, requires that all Federal agencies, including Department of the Army, to review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SIP attainment schedule of the NAAQS, or otherwise contradict the State's SIP. The State of Maine is authorized by the EPA to administer its own air emissions permit program, which is shaped by its State Implementation Plan (SIP). The SIP sets the basic strategies for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS). The SIP is the federally enforceable plan that identifies how that state will attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) established by the EPA (U.S. Environmental Protection Agency, 2004). In Maine, Federal actions must conform to the Maine state implementation plan or Federal implementation plan. For non-exempt activities, the Corps must evaluate and determine if the proposed action (construction and operation) will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone.

When the total direct and indirect emissions caused by the operation of the Federal action/facility are less than threshold levels established in the rule (40 C.F.R. § 93.153), a Record of Nonapplicability (RONA) is prepared and signed by the facility environmental coordinator.

8.1 General Conformity

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. However, this maintenance dredging project is exempt from performing a conformity review based on 40 CFR 93.153(c)(2) *The following actions which would result in no emissions increase or an increase in emissions that is clearly de minimis:* (ix) *Maintenance dredging and debris disposal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site.* The dredging of the Kennebec River Federal Navigation Channel falls into this category and is therefore exempt and a RONA does not need to be prepared for this project.

9. Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" require federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. The proposed action will not have any disproportionate high or adverse impacts on minority or low-income populations, or any adverse short or long-term environmental justice impacts because the proposed action will be dredging a Federal channel located in the waters of the Kennebec River, with in river disposal of the dredged material a downstream of Bluff Head, and nearshore disposal at Jackknife Ledge. There are no environmental justice populations located in these areas.

10. Protection of Children

Executive Order 13045 "Protection of Children from Environmental Health Risks and Safety Risks" seeks to protect children from disproportionately incurring environmental health risks or safety risks that might arise as a result of Army policies, programs, activities and standards. Environmental health risks and safety risks include risks to health and safety attributable to products or substances that a child is likely to come in contact with or ingest.

The proposed project involves the maintenance dredging of an existing federal navigation channel. Work will be done in the federal navigation channel, and therefore away from public access and in adherence to navigational safety regulations. The dredged material is clean sand, and therefore suitable for disposal at the designated disposal area. Therefore the activity is not expected to disproportionately affect the safety of children, including negatively affecting fisheries/shellfisheries resources, which could be consumed by children.

11. Actions Taken To Minimize Impacts:

The dredging will be conducted in accordance with any proposed construction windows designed to minimize potential negative effects to shellfish and finfish resources in the disposal areas as well as adhering to the conservation recommendations provided by the National Marine Fisheries Service.

G. Coordination (*to be updated*)

This project was coordinated with state, local and federal agencies including the Environmental Protection Agency; the U.S. Fish and Wildlife Service; the National Marine Fisheries Service; the Maine Department of Environmental Protection; and the Maine State Office of Historic Preservation (1997 project). A public notice was issued on February 20, 2002 that requested comments on future periodic maintenance dredging. Several letters were received in response to the public notice for this project. The letters were opposed to dredging at Popham Beach because they believe that lobster catches decline the year dredging occurs at Popham Beach and in subsequent years. A suggestion was made to remove the juvenile lobsters prior to dredging, as was done for the Portland Harbor project. Another letter was received that expressed concern about erosion on Popham Beach. See the coordination section for a response to these letters. A meeting was held with the locals to address these concerns. This coordination assures compliance with the statutes, laws, and executive orders listed in the Section I Compliance Table.

APPENDIX 2A

BR-IAB-86-4
Biological Report
Kennebec River
Sagadahoc County, Maine

William A. Hubbard
Marine Ecologist

5 May 1986

Impact Analysis Branch
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149

INTRODUCTION:

On May 1 and 2, 1986, intertidal rocky and sandflat biota and water chemistry were sampled form the Kennebec River in Sagadahoc County, Maine. The purpose of this sampling effort was to describe the affected environment in the vicinity of the Kennebec River Federal channel. This sampling was performed to assist in the preparation of an Environmental Assessment concerning impacts from the proposed maintenance dredging project at Doubling Point (see Figure 1).

The water chemistry analyses were performed approximately 500 meters north of Carlton Bridge (Figure 2). The intertidal biological sampling occurred between Doubling Point and Bluff Head on the eastern shore of the river. The Kennebec River experiences a mean tidal range of 1.9 meters at Bath, Maine in the vicinity of the sampling stations (43° 55' by 69° 49'). Current velocities flood 133.7 cm/sec (2.6 knots) 300' northwest by west and ebb 154.3 cm/sec (3.0 knots) 127 degrees southeast by east in the dredging vicinity (43° 52.8' by 60 degrees 48.4'). In the vicinity of the disposal site (43° 5.3' by degrees 47.8') the maximum flood is 118.3 cm/sec 184 degrees (2.3 knots) 14 degrees north by east and ebbs a maximum of 145.3 cm/sec 184 degrees southeast by east. Air temperature during sampling ranged from 14.0° Celsius to 16.5° Celsius. Water temperature ranged from 11.5° Celsius to 14.0° Celsius and salinity from 0.0 ppt to 3.5 ppt north of the project area (Table 1).

MATERIALS AND METHODS:

Sampling of the intertidal habitat occurred by placing three random 20cm by 20 cm grids, one meter apart, on the substrate. All epifaunal organisms within the grid were excavated to a depth of 20 cm, where possible, and screened through a 1.0 mm sieve. Those organisms on the screen were also enumerated. Where it was not possible to identify an organism in the field, they were preserved in 10 % buffered formalin, labeled and returned to the laboratory for identification. Field notes were made of the substrate, algal cover and waterfowl present (Tables 2 and 3).

Two areas were sampled. Station 1 was located in an intertidal, rocky habitat and Station 2 on intertidal mudflat (Figure 3) habitat. The water chemistry station was located approximately 500 meters north of the Carlton (Route 1) Bridge.

Temperature and salinity was measured by a Yellow Springs Instrument Company Model 33 salinometer at one meter intervals through the tidal cycle. Dissolved oxygen concentrations were determined using a LaMotte Model EDO modified Winkler titration method at 0.3 meters subsurface. A secchi disc was also used as an indication of water column turbidity.

CHEMICAL RESULTS:

The water temperature ranged form a high of 14.0°C at surface low tide to a low of 11.5° C at surface high tide (see Table 1). Salinity was zero parts per thousand through all tides except mid-ebb. The 3.5 ppt salinity at mid-ebb proves the salt wedge does travel past the project area, mixing with the river outflow. Dissolved oxygen approached saturation at all tides, usually slightly less than saturation (within 1 ppm). Secchi depths ranged from 1.75 meters to 2.25 meters through the tidal cycle, indicative of riverine turbidity and the silt-load of the river from spring runoff.

BIOLOGICAL:

The rocky lower intertidal areas along the Kennebec River contain various shelves and flats that accrue fine sand and silts. This biological sampling occurred at two places. One was an intertidal rocky area with silty sand and deposits among crevices and an upland gradation into a narrow marsh (*Spartina alterniflora* and *Distichlis spicata*) to rock cliff shoreland. The second was a crescent shaped sandy silt mudflat with a gradual slope through marsh (*Spartina* sp.) to shoreland.

The rocky intertidal area was a heterogeneous environment. Shorelands were dominated by eastern white pines, *Pinus strobus*; hemlock, *Tsuga canadensis* and northern hardwood species. A vertical 3.5 meter drop down the rockface then sloped at approximately 30 degrees for 3.3 meters to the low tide level of the river.

The intertidal slope from the base of the rock cliff to the river was a mixture of marsh and rock. The first 0.7 meters from the cliff was upland grasses. A 1.5 meter band of *Phragmites australis* sloped from the grasses through a 0.5 meter band of *Distichlis spicata* and 0.5 meter rock. A 4.7 meter band of *Spartina alterniflora* (an average of 257.3 culms per square meter) then sloped to the *Fucus vesiculosus* and rocky low intertidal area where Station 1 was established.

At Station 1 three epifaunal grids were excavated to 20cm where possible, the silty-sand was mostly only 5-10cm deep over the rock ledge (see Table 2). This sandy substrate was collecting in the crevices with *Fucus vesiculosus* cover. Additional algal cover present was *Enteromorpha intestinalis* and *Ulva lactuca*. The algae harbored a crustacean population of approximately 2,390.4/square meters gammarid amphipods; *Gammarus lawrencianus*. Two herring gulls, *Larus argentatus* were observed foraging the river.

At Station 2 the three grids were devoid of epifaunal. Infaunal excavation and subsequent screening through a 1.0mm screen recovered two (2) species (see Table 3). The soft-shell clam, *Mya arenaria*, was present at approximate densities of 25.9/square meters with the polychaete, *Nereis virens*, also at 24.9/square meters. This area had approximately 15 cm of silty sand overlaying gravel and rock ledge.

DISCUSSION:

WATER CHEMISTRY

Table 1 lists the measurements of water chemistry determinations organized by tidal quarter. These measurements depict a riverine/estuarine interaction. The measurements were made on May 1 and 2, 1986. This spring season is typified by increased freshwater runoff. The results reflect a dominance of riverine influence at this upstream area from the proposed dredging. The biota in the vicinity of the project area (both dredging and disposal), is estuarine. Saline intrusion does occur through and above the dredging and disposal area.

In May, the river water was measured as having an 11.50 to 14°C range in temperature. Salinity was measured north of the project as 3.5 ppt in the shallows. The "salt wedge" or deep cold saline layer, can be expected to be greater than 3.5 ppt in the deeper river areas such as the channel. Dissolved oxygen concentrations reflected some net oxygen consumption, but generally approaches saturation; ranging 9.6ppm to 9.9ppm. Secchi determinations identified riverine silt load contributing to turbidity with measurements of 1.75 to 3.25 meters.

BIOLOGICAL

The shorelands along the Kennebec River were mostly undeveloped forests dominated by eastern white pines, *Pinus strobus* and hemlock, *Tsuga canadensis*. The banks of the river consisted of rough vertical cliffs of approximately 4-8 meters in height.

The intertidal slope of the base of these cliffs formed narrow bands of marsh and rocky-sandy crevice areas with algal growth. The marsh area was generally less than 10 meters wide. The shoreland border of the marsh band was dominated by the common reed, *Phragmites australis*, transitioning to a spikegrass, *Distichlis spicata*, high marsh and then to a cordgrass, *Spartina alterniflora* (257.3 culms/square meters) border above the algal covered rocks in the low intertidal areas.

The rocky lower intertidal area, sampled at Station 1 was dominated by the amphipod *Gammarus lawrencianus* inhabiting the algal cover of the rock and sandfilled crevices. The dominant algae was the rockweed, *Fucus vesiculosus*. Additionally some sea lettuce, *Ulva lactuca* and some hollow green weeds, *Enteromorpha intestinalis*, were present. The algal cover with its associated crustaceans are probably significant forage at flood tides for river finfish.

Section 2 was located on a crescent shaped intertidal sandy mudflat. This area graded from shoreland to marsh to mudflat over a 50 meter shelf. The mudflat was dominated by the bivalve *Mya arenaria* (24.9/square meters) commonly called the softshell clam, and the polychaete *Nereis virens* (24.9/square meters), the clam worm. These densities are low, but may reflect predation, harvesting, sample size, sieve size and/or seasonality.

APPENDIX 2B

Biological Report

Jackknife Ledge Nearshore
Disposal Site
Kennebec River, Maine

prepared by
William A. Hubbard
Marine Ecologist

6 July 1989

INTRODUCTION:

On July 1989 five benthic samples were obtained from within the boundary of a proposed nearshore disposal site at the mouth of the Kennebec River in Maine (See Figure 3 in EA). The purpose of this sampling was to characterize the benthic ecology of the site. The sampling was designed to allow a biological description of the impacted community and allow estimation of recolonization time. Also of concern was the presence or absence of commercially valuable species e.g. juvenile shellfish.

METHODOLOGY:

A commercial fishing vessel outfitted with radar and loran positioned the grab at the center (Station A); north (Station B); east (Station C); west (Station D) and south (Station E) points of the disposal site. A 0.04 square meter VanVeen grab sample was obtained at each station. The sample was visually and textually characterized, labeled and stored on deck.

A temperature and salinity profile was obtained using a Yellow Springs Instrument (YSI) Model 33 salinometer at 5 meter intervals at the center of the site. The water clarity was measured for a secchi depth. Dissolved oxygen concentrations were taken at surface (0.3) meters and bottom using a modified Winkler titration. A five minute plankton net deployment was performed to characterize the surficial planktonic community.

At the dock, benthic samples were sieved in seawater using a 0.5mm screen. The contents were then stained with rose bengal and preserved in a 10% buffered formalin and seawater solution. All organisms were removed and microscopic identification were performed in the laboratory.

RESULTS:

Table 1 is a species list of all organisms recovered. Table 2 through 6 list the raw data for species densities and field observations, with Table 7 presenting the average number of species per meter. Table 8 lists those organisms representing the ten most dominant taxa, with % dominance. Table 9 lists the water quality parameters measured at the time of sampling.

DISCUSSION:

The benthic community of the nearshore disposal site for the Kennebec River dredging project was dominated by organisms adaptive to shifting sands. On a community level, the species guilds represent colonization stages of pioneering organisms on disturbed substrates. Storm activity and littoral process are probably sufficient to define this type of community.

The averaged sampling results define a community of 37 species with a density of 18,360 organisms per square meter. The community was dominated by pioneering organism, of the Oligochaete sp. (27.8%); and the polychaetes *Prionospio steenstrupi* (22.2%) and *Capitella capitata* 11.6% representing 61.6% of all organisms. The bivalve *Nucula delphinodonta* (9.6%), a small clam called the "nut clam", and the predatory polychaete *Aricidea catherinae* (8.6%) were also abundant. The top ten numerically dominant species comprised 91.3% of all organisms.

This community type is probably a result of the winter storm disturbance and recolonization of benthos. The spring recruitment of less dominant species and the low energy of summer storms potentially account for the high species number (37). This type of community will quickly recolonize any disturbed area if the grain size after disturbance is not excessively different.

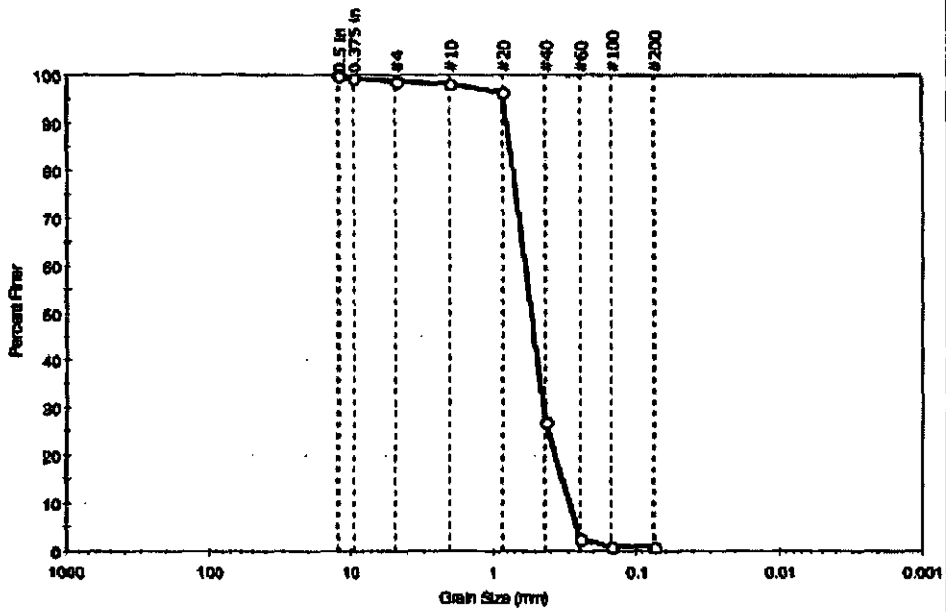
APPENDIX 3

Sediment Grain Size Graphs for Kennebec River

GeoTesting
EXPRESS

Client: U.S. Army Corps of Engineers			
Project: Kennebec River			
Location: ---		**Project No:**	GTX-10487
Boring ID: ---	**Sample Type:** bag	**Tested By:**	jbr
Sample ID: Kennebec A	**Test Date:** 01/04/11	**Checked By:**	jdt
Depth : ---	**Test Id:** 202154		
Test Comment: ---			
Sample Description: Moist, brown sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	1.1	98.1	0.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	99		
#10	2.00	98		
#20	0.85	96		
#40	0.42	27		
#60	0.25	3		
#100	0.15	1		
#200	0.075	1		

Coefficients

D_{85} = 0.7579 mm	D_{30} = 0.4371 mm
D_{60} = 0.5902 mm	D_{15} = 0.3261 mm
D_{50} = 0.5340 mm	D_{10} = 0.2925 mm
C_u = 2.018	C_c = 1.107

Classification

ASTM: Poorly graded sand (SP)

AASHTO: Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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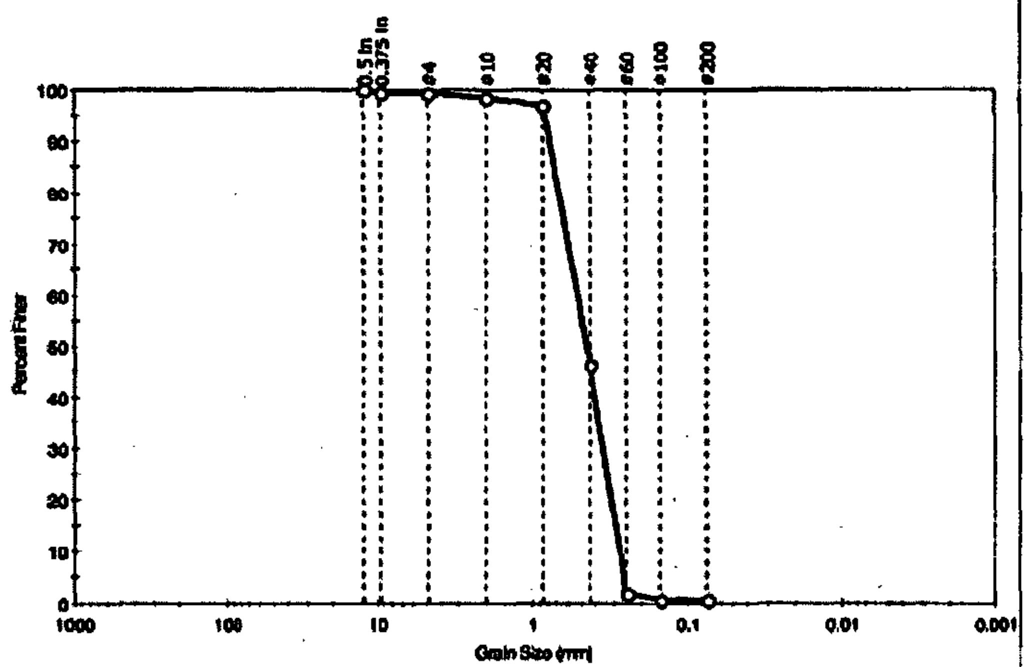
GeoTesting EXPRESS

Client:	U.S. Army Corps of Engineers				
Project:	Kennebec River				
Location:	---			Project No:	GTX-10487
Boring ID: ---		Sample Type:	bag	Tested By:	jbr
Sample ID: Kennebec C		Test Date:	01/04/11	Checked By:	jdt
Depth : ---		Test Id:	202155		
Test Comment:	---				
Sample Description:	Moist, brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
-	0.6	98.7	0.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	99		
#20	0.85	97		
#40	0.42	46		
#60	0.25	2		
#100	0.15	1		
#200	0.075	1		

Coefficients

D_{85} = 0.7202 mm	D_{30} = 0.3498 mm
D_{60} = 0.5118 mm	D_{15} = 0.2928 mm
D_{50} = 0.4464 mm	D_{10} = 0.2759 mm
C_u = 1.855	C_c = 0.867

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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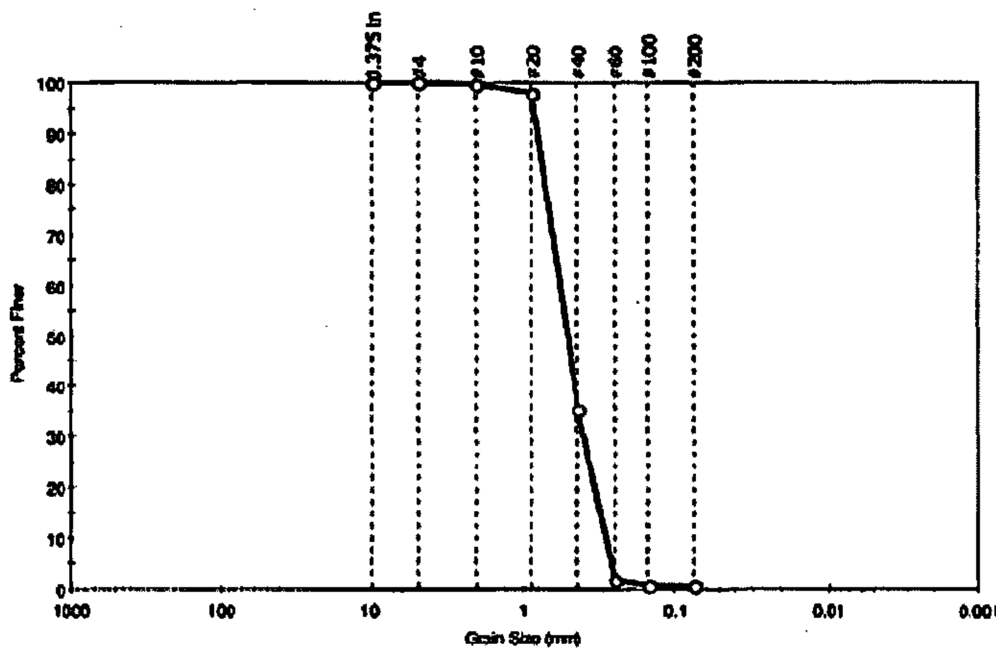
GeoTesting EXPRESS

Client:	U.S. Army Corps of Engineers				
Project:	Kennebec River				
Location:	---			Project No:	GTX-10487
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	Kennebec D	Test Date:	01/04/11	Checked By:	jdt
Depth :	---	Test Id:	202156		
Test Comment:	---				
Sample Description:	Moist, dark brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.1	99.4	0.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	98		
#40	0.42	35		
#60	0.25	2		
#100	0.15	1		
#200	0.075	0		

Coefficients

D_{85} = 0.7359 mm	D_{30} = 0.3907 mm
D_{60} = 0.5582 mm	D_{15} = 0.3085 mm
D_{50} = 0.4998 mm	D_{10} = 0.2852 mm
C_u = 1.957	C_c = 0.959

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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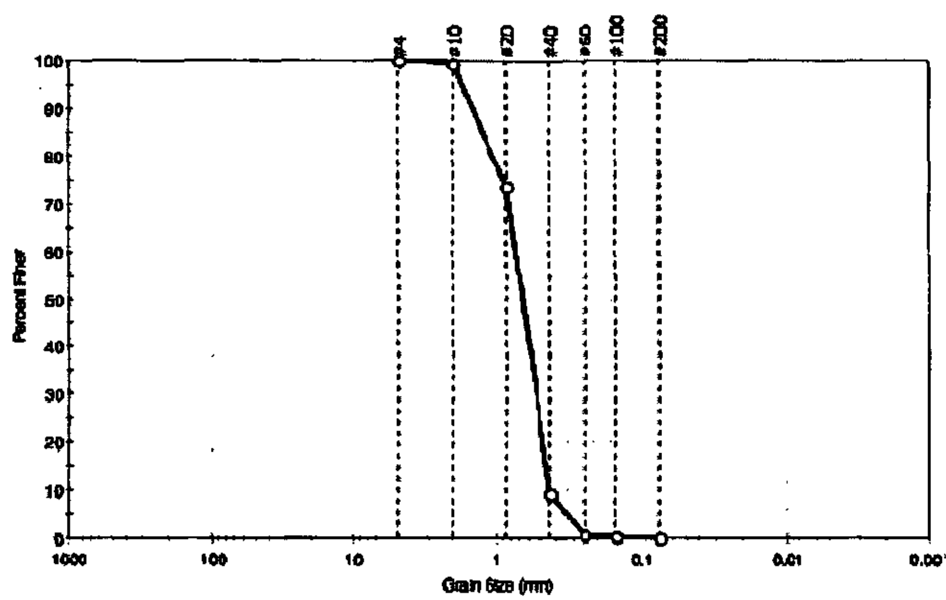
GeoTesting EXPRESS

Client: U.S. Army Corps of Engineers					
Project: Kennebec River					
Location: ---				Project No:	GTX-10487
Boring ID: ---	Sample Type:	bag		Tested By:	jbr
Sample ID: Kennebec E	Test Date:	01/04/11		Checked By:	jdt
Depth : ---	Test Id:	202157			
Test Comment: ---					
Sample Description: Moist, brown sand					
Sample Comment: ---					

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	99.9	0.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	[illegible]		
#40	0.42	[illegible]		
#60	[illegible]	1		
#100	[illegible]	0		
#200	[illegible]	0		

Coefficients

D_{85} = 1.2316 mm	D_{30} = 0.5297 mm
D_{60} = 0.7319 mm	D_{15} = 0.4507 mm
D_{50} = 0.6571 mm	D_{10} = 0.4271 mm
C_u = 1.714	C_c = 0.898

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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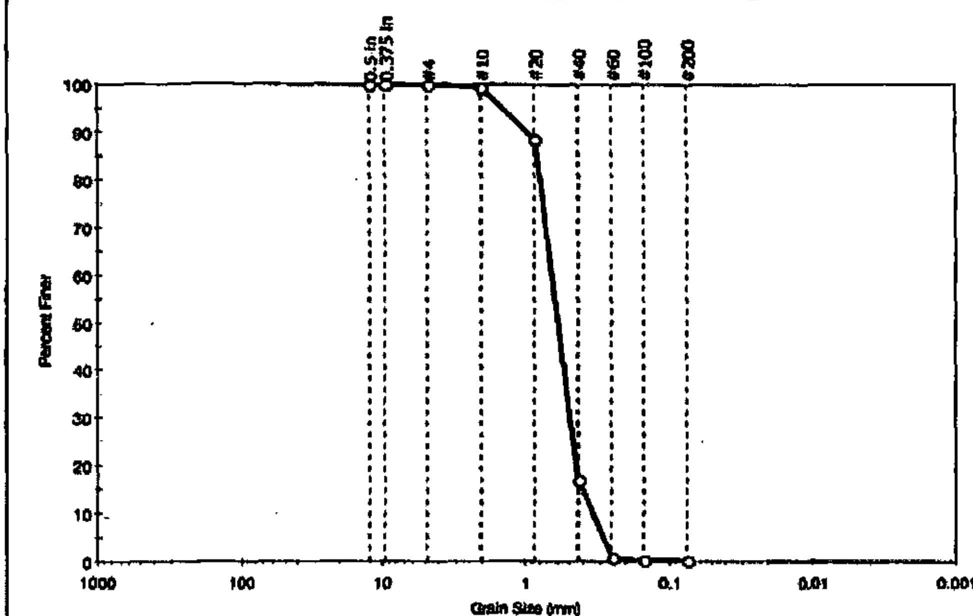
GeoTesting EXPRESS

Client: U.S. Army Corps of Engineers			
Project: Kennebec River			
Location: ---		Project No:	GTX-10487
Boring ID: ---	Sample Type: bag	Tested By:	jbr
Sample ID: Kennebec F	Test Date: 01/04/11	Checked By:	jdt
Depth : ---	Test Id: 202158		
Test Comment: ---			
Sample Description: Moist, brown sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.1	99.6	0.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	88		
#40	0.42	17		
#60	0.25	1		
#100	0.15	0		
#200	0.075	0		

Coefficients

D_{85} = 0.8219 mm	D_{30} = 0.4818 mm
D_{60} = 0.6448 mm	D_{15} = 0.3968 mm
D_{50} = 0.5851 mm	D_{10} = 0.3364 mm
C_u = 1.917	C_c = 1.070

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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GeoTesting EXPRESS

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Project:	Kennebec River				
Location:	---			Project No:	GTX-10487
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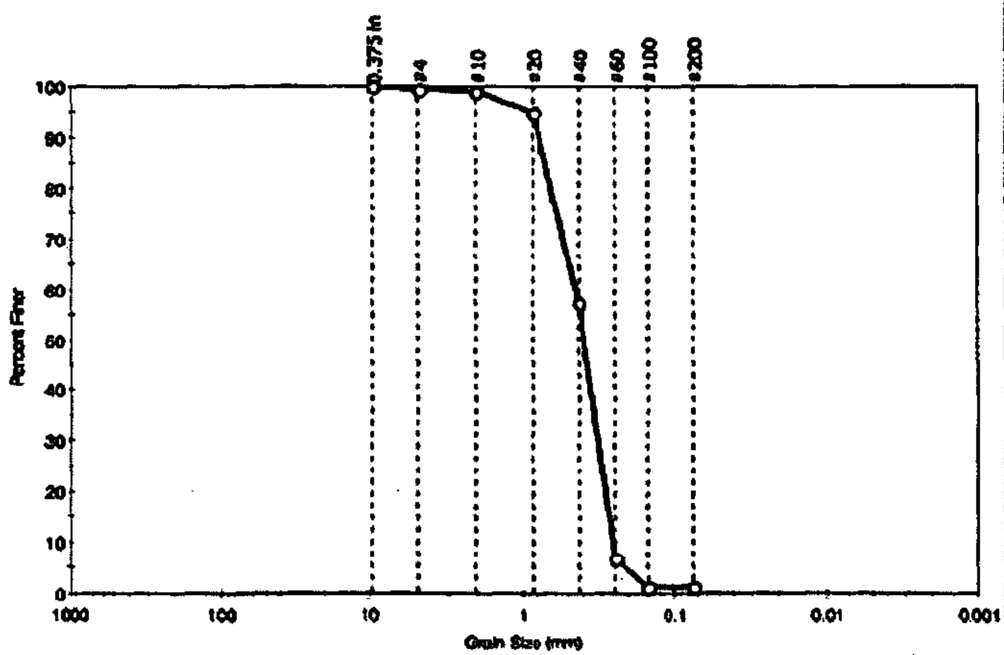
Sample ID	Kennebec H	Test Date:	01/04/11	Checked By:	jdt
Depth :	---	Test Id:	202159		
Test Comment:	---				
Sample Description:	Moist, brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.4	98.5	1.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	95		
#40	0.42	57		
#60	0.25	7		
#100	0.15	1		
#200	0.075	1		

Coefficients

D_{85} = 0.7063 mm	D_{30} = 0.3191 mm
D_{60} = 0.4462 mm	D_{15} = 0.2727 mm
D_{50} = 0.3935 mm	D_{10} = 0.2580 mm
C_u = 1.724	C_c = 0.882

Classification

ASTM Poorly graded sand (SP)

AASHTO Fine Sand (A-3 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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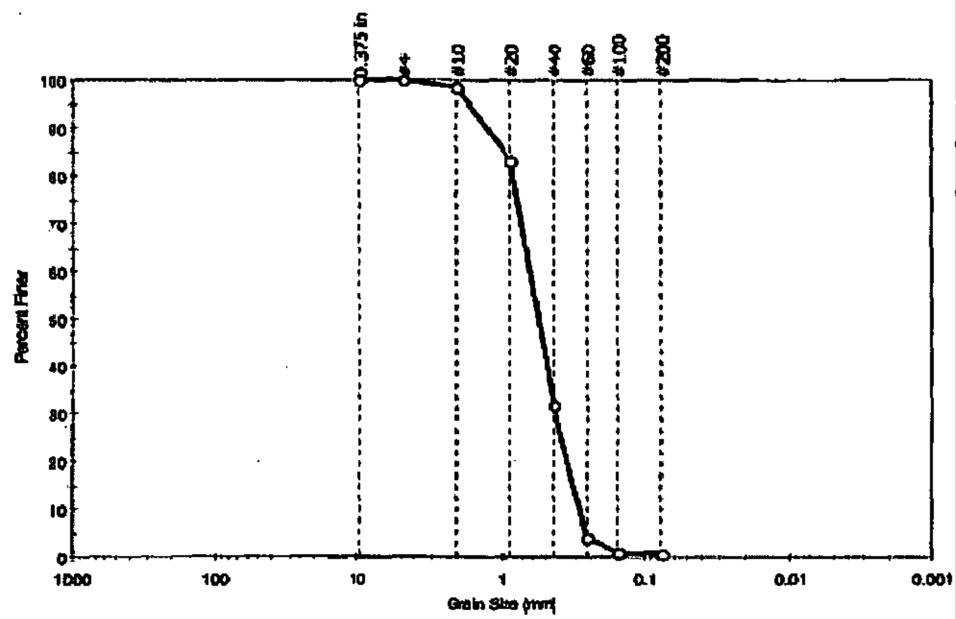
GeoTesting
EXPRESS

Client: U.S. Army Corps of Engineers			
Project: Kennebec River			
Location: ---		Project No:	GTX-10437
Boring ID: ---	Sample Type: bag	Tested By:	jbr
Sample ID: Kennebec I	Test Date: 01/04/11	Checked By:	jdt
Depth : ---	Test Id: 202160		
Test Comment: ---			
Sample Description: Moist, brown sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.1	99.4	0.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	98		
#20	0.85	83		
#40	0.42	32		
#60	0.25	4		
#100	0.15	1		
#200	0.075	1		

Coefficients

D_{85} = 0.9387 mm	D_{30} = 0.4093 mm
D_{60} = 0.6203 mm	D_{15} = 0.3075 mm
D_{50} = 0.5434 mm	D_{10} = 0.2795 mm
C_u = 2.221	C_c = 0.965

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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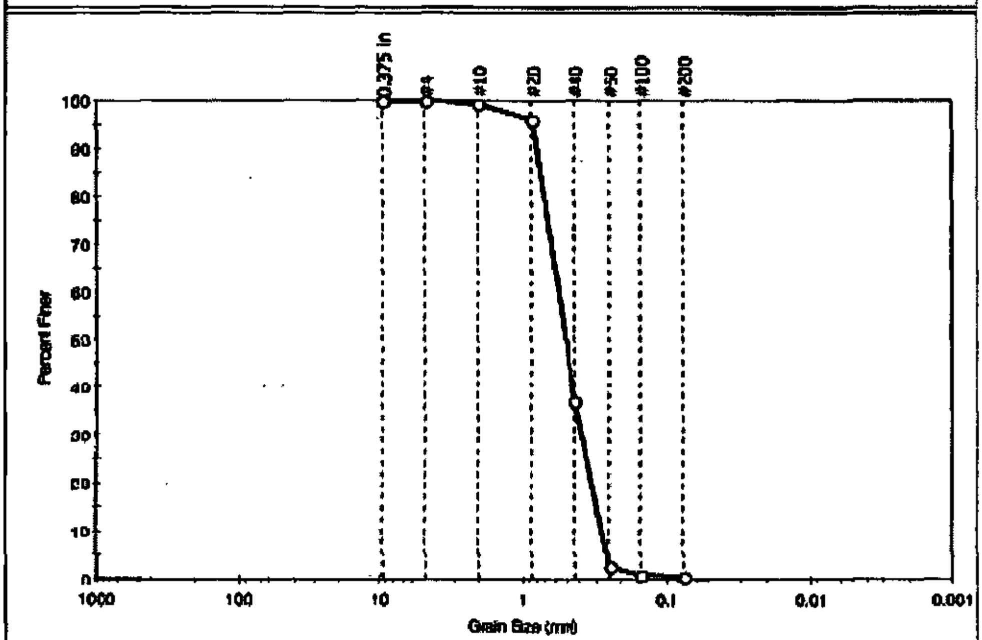
GeoTesting EXPRESS

Client:	U.S. Army Corps of Engineers		
Project:	Kennebec River		
Location:	---	Project No:	GTX-10497
Boring ID: ---	Sample Type: bag	Tested By:	jbr
Sample ID: Disposal Site	Test Date: 01/04/11	Checked By:	jdt
Depth : ---	Test Id: 202161		
Test Comment:	---		
Sample Description:	Moist, brown sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel	%Sand	% Silt & Clay Size
—	0.1	99.4	0.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	96		
#40	0.42	37		
#50	0.30	3		
#100	0.15	1		
#200	0.071	0		

Coefficients

D_{85} = 0.7457 mm	D_{30} = 0.3805 mm
D_{60} = 0.5556 mm	D_{15} = 0.3026 mm
D_{50} = 0.4939 mm	D_{10} = 0.2803 mm
C_u = 1.982	C_c = 0.930

Classification

ASTM Poorly graded sand (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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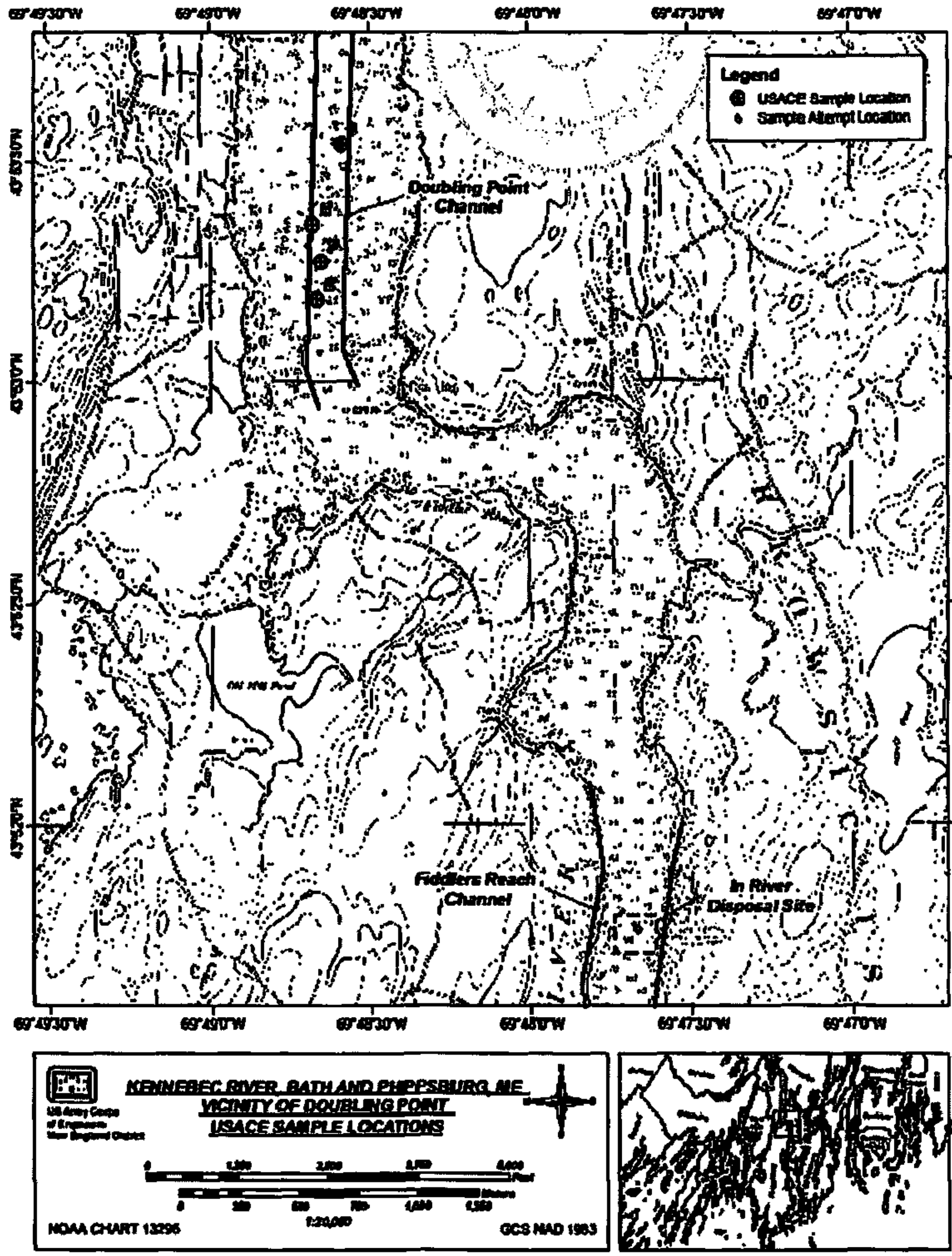
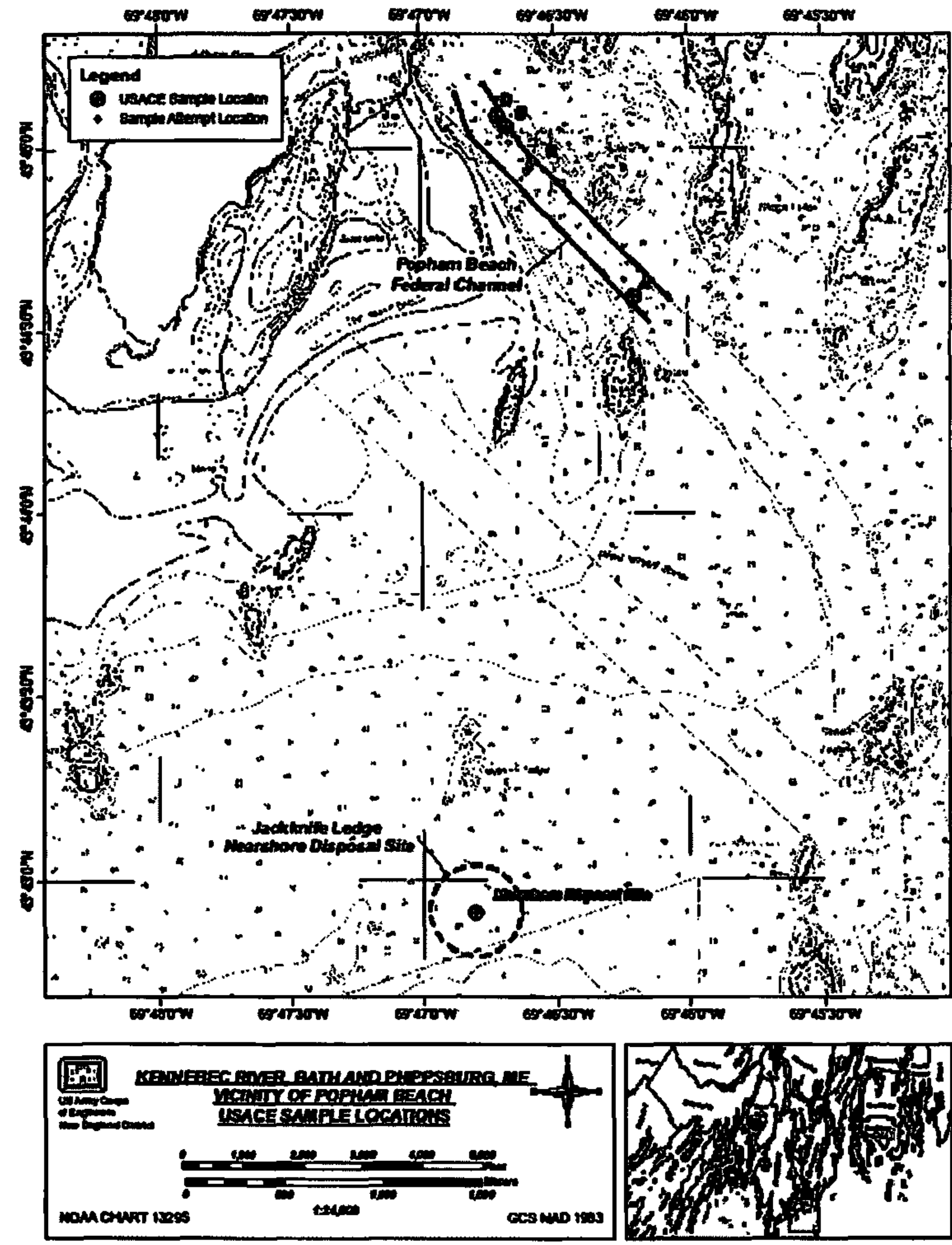

Legend
USACE Sample Location
Sample Attempt Location
Doubling Point Channel
Fiddlers Reach Channel
In River Disposal Site
KENNEBEC RIVER, BATH AND PHIPPSBURG, ME
VICINITY OF DOUBLING POINT
USACE SAMPLE LOCATIONS
NOAA CHART 13296
GCS NAD 1983


Legend
USACE Sample Location
Sample Attempt Location
Popham Beach
Federal Channel
Jackknife Ledge
Nearshore Disposal Site
KENNEBEC RIVER, BATH AND PHIPPSBURG, ME
VICINITY OF POPHAM BEACH
USACE SAMPLE LOCATIONS
NOAA CHART 13295
GCS NAD 1983

Appendix 6

Life Histories of Species
Inhabiting the Essential Fish Habitat of the Kennebec River

Atlantic Salmon (*Salmo salar*)
Juveniles: Bottom habitats of shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries. Generally, the following conditions exist where Atlantic salmon parr are found: clean, well-oxygenated fresh water, water temperatures below 25^0 C, water depths between 10 cm and 61 cm, and water velocities between 30 and 92 cm per second. As they grow, parr transform into smolts. Atlantic salmon smolts require access downstream to make their way to the ocean. Upon entering the sea, "post-smolts" become pelagic and range from Long Island Sound north to the Labrador Sea.

Adults: For adult Atlantic salmon returning to spawn, habitats with resting and holding pools in rivers and estuaries. Returning Atlantic salmon require access to their natal streams and access to the spawning grounds. Generally, the following conditions exist where returning Atlantic salmon adults are found migrating to the spawning grounds: water temperatures below 22.8^0 C, and dissolved oxygen above 5 ppm. Oceanic adult Atlantic salmon are primarily pelagic and range from the waters of the Continental Shelf off southern New England north throughout the Gulf of Maine.

Atlantic cod (*Gadus morhua*) –
Juveniles: Bottom habitats with a substrate of cobble or gravel in the Gulf of Maine, Georges Bank, and the eastern portion of the Continental Shelf off southern New England. Generally, the following conditions exist where cod juveniles found: water temperatures below 20^0 C, water depths from 25 to 75 meters, and a salinity range from 30-35‰.

Adults: Bottom habitats with a substrate of rocks, pebbles, or gravel in the Gulf of Maine, Georges Bank, southern New England, and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where cod adults are found: water temperatures below 10^0 C, water depths from 10 to 150 meters, and a wide range of oceanic salinities.

Pollock (*Pollachius virens*) –
Juveniles: Bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where pollock juveniles are found: water temperatures below 18^0 C, water depths from 0 to 250 meters, and salinities between 29-32‰.

Whiting (*Merluccius bilinearis*) –
Juveniles: Bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where most whiting juveniles are found: water temperatures below 21^0 C, water depths from 20 to 270 meters, and salinities greater than 20‰.

Adults: Bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras.

Generally, the following conditions exist where most whiting juveniles are found: water temperatures below 21^0 C, water depths from 20 to 270 meters, and salinities greater than 20‰.

Red hake (*Urophycis chuss*) –
Juveniles: Bottom habitats with a substrate of shell fragments, including areas with an abundance of live scallops, in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake juveniles are found: water temperatures below 16° C, depths less than 100 meters and a salinity range from 31 - 33‰.

Adults: Bottom habitats in depressions with a substrate of sand and mud in the Gulf of Maine, on Georges Bank, the Continental Shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake adults are found: water temperatures below 12 ° C, depths from 10 to 130 meters, and a salinity range from 33 - 34‰.

White hake (*Urophycis tenuis*) –
Juveniles: *Pelagic stage* – Pelagic waters of the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the middle Atlantic. White hake juveniles in the pelagic stage are most often observed from May through September. *Demersal stage* – Bottom habitats with seagrass beds or a substrate of mud or fine-grained sand in the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the middle Atlantic. Generally, the following conditions exist where white hake juveniles are found: water temperatures below 19 ° C and depths from 5 - 225 meter.

Adults: Bottom habitats with a substrate of mud or fine-grained sand in the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the middle Atlantic. Generally, the following conditions exist where white hake adults are found: water temperatures below 14 ° C and depths from 5 - 325 meter.

Winter flounder (*Pleuronectes americanus*) –
Eggs: Bottom habitats with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder eggs are found: water temperatures below 10 ° C, salinities between 10 - 30‰ and water depths less than 5 meters. On Georges Bank, winter flounder eggs are generally found in water less than 8 ° C, and less than 90 meters deep. Winter flounder eggs are often observed from February to June with a peak in April on Georges Bank.

Larvae: Pelagic and bottom waters of Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder larvae are found: sea surface temperatures less than 15^0 C, salinities between 4 - 30‰, and water depths less than six meters. On Georges Bank, winter flounder larvae are generally found in water less than 8^0 C, and less than 90 meters deep. Winter flounder larvae are often observed from March to July with peaks in April and May on Georges Bank.

Juveniles: *Young-of-the-Year*: Bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder young-of-the-year are found: water temperatures below 28° C, and depths from 0.1 – 10 meters, and salinities between 5 - 33‰. *Age 1 + Juveniles*: Bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where juvenile winter flounder are found: water temperatures below 25° C, and depths from 1 – 50 meters, and salinities between 10 - 30‰.

Adults: Bottom habitats including estuaries with a substrate of mud, sand and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where adult winter flounder are found: water temperatures below 25° C, and depths from 1 – 100 meters, and salinities between 15 - 33‰.

Spawning Adults: Bottom habitats including estuaries with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where spawning adult winter flounder are found: water temperatures below 15° C, depths less than 6 meters, except on Georges Bank where they spawn as deep as 80 meters, and salinities 5.5 - 36‰. Winter flounder are most often observed spawning during the months of February to June.

Yellowtail flounder (*Pleuronectes ferruginea*) –

Eggs: Surface waters of Georges Bank, Massachusetts Bay, Cape Cod Bay, and the southern New England continental shelf south to Delaware Bay. Generally, the following conditions exist where yellowtail eggs are found: sea surface temperatures below 15^0 C, water depths from 30 – 90 meters and a salinity range from 32.4 – 33.5‰. Yellowtail flounder eggs are most often observed during the months from mid-March to July, with peaks in April to June in southern New England.

Larvae: Surface waters of Georges Bank, Massachusetts Bay, Cape Cod Bay, the southern New England shelf and throughout the middle Atlantic south to the Chesapeake Bay. Generally, the following conditions exist where yellowtail larvae are found: sea surface temperatures below 17^0 C, water depths from 10 – 90 meters, and a salinity range from 32.4 – 33.5‰. Yellowtail flounder larvae are most often observed from March through April in the New York bight and from May through July in southern New England and southeastern Georges Bank.

Windowpane flounder (*Scopthalmus aquosus*) –
Eggs: Surface waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowpane flounder eggs are found: sea surface temperatures less than 20^0 C, water depths less than 70 meters. Windowpane flounder eggs are often observed from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

Larvae: Pelagic waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowplane flounder larvae are found: sea surface temperatures less than 20^0 C, water depths less than 70 meters. Windowpane flounder larvae are often observed from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

Juveniles: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where windowpane flounder juveniles are found: water temperatures below 25^0 C, water depths from 1 – 100 meters, and a salinity range from 5.5 – 36‰.

Adults: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, the following conditions exist where windowpane flounder adults are found: water temperatures below 26.8^0 C, water depths from 1 – 75 meters, and salinities between 5.5 – 36‰.

Spawning Adults: Bottom habitats with a substrate of mud or fine-grained sand in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, the following conditions exist where spawning windowpane flounder adults are found: water temperatures below 21^0 C, water depths from 1 – 75 meters, and salinities between 5.5 – 36‰. Windowpane flounder are most often observed spawning during the months February – December with a peak in May in the middle Atlantic.

American plaice (*Hippoglossoides platessoides*) –
Eggs: Surface waters of the Gulf of Maine and Georges Bank. Generally, the following conditions exist where most American plaice eggs are found: sea surface temperatures below 12^0 C, water depths between 30 and 90 meters and a wide range of salinities. American plaice eggs are observed all year in the Gulf of Maine, but only from December through June on Georges Bank, with peaks in both areas in April and May.

Larvae: Surface waters of the Gulf of Maine, Georges Bank and southern New England. Generally, the following conditions exist where most American plaice larvae are found: sea surface temperatures below 14^0 C, water depths between 30 and 130 meters and a wide range of salinities. American plaice larvae are observed between January and August, with peaks in April and May.

Juveniles: Bottom habitats with fine-grained sediments or a substrate of sand or gravel in the Gulf of Maine. Generally, the following conditions exist where most American plaice juveniles are found: water temperatures below 17^0 C, water depths between 45 and 150 meters, and a wide range of salinities.

Adults: Bottom habitats with fine-grained sediments or a substrate of sand or gravel in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where most American plaice adults are found: water temperatures below 17^0 C, water depths between 45 and 175 meters, and a wide range of salinities.

Spawning Adults: Bottom habitats of all substrate types in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where most spawning American plaice adults are found: water temperatures below 14^0 C, water depths less than 90 meters, and a wide range of salinities. Spawning begins in March and continues through June.

<u>Ocean pout (*Macrozoarces americanus*)</u> –
Eggs: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Due to low fecundity, relatively few eggs (<4,200) are laid in gelatinous masses, generally in hard bottom sheltered nests, holes, or crevices where they are guarded by either female or both parents. Generally, the following conditions exist where ocean pout eggs are found: water temperatures below 10^0 C, depths less than 50 meters, and salinity range from 32 – 34‰. Ocean pout egg development takes two to three months during late fall and winter.

Larvae: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Larvae are relatively advanced, in development and are believed to remain in close proximity to hard bottom nesting areas. Generally, the conditions exist where ocean pout larvae are found: sea surface temperatures below 10^0 C, depths less than 50 meters, and salinities greater than 25‰. Ocean pout larvae are most often observed from late fall through spring.

Juveniles: Bottom habitats, often smooth bottom near rocks or algae in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where ocean pout juveniles are found: water temperatures below 14^0 C, depths less than 80 meters, and salinities greater than 25‰.

Adults: Bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where ocean pout adults are found: water temperatures below 15^0 C, depths less than 110 meters, and a salinity range from 32 – 34‰.

Spawning Adults: Bottom habitats with a hard bottom substrate, including artificial reefs and shipwrecks, in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay. Generally, the following conditions exist where spawning ocean pout adults are found: water temperatures below 10^0 C, depths less than 50 meters, and a salinity range from 32 – 34‰. Ocean pout spawn from late summer through early winter, with peaks in September and October.

Atlantic halibut (*Hippoglosus hippoglossus*) –
Eggs: Pelagic waters to the sea floor of the Gulf of Maine and Georges Bank. Generally, the following conditions exist where Atlantic halibut eggs are found: water temperatures between 4 and 7^0 C, water depths less than 700 meters, and salinities less than 35‰. Atlantic halibut eggs are observed between late fall and early spring, with peaks in November and December.

Larvae: Surface waters of the Gulf of Maine and Georges Bank. Generally, the following conditions exist where Atlantic halibut larvae are found: salinities between 30 and 35‰.

Juveniles: Bottom habitats with a substrate of sand, gravel, or clay in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where Atlantic halibut juveniles are found: water temperatures above 2^0 C, water depths from 20 - 60 meters.

Adults: Bottom habitats with a substrate of sand, gravel, or clay in the Gulf of Maine and Georges Bank. Generally, the following conditions exist where Atlantic halibut adults are found: water temperatures below 13.6^0 C, water depths from 100 - 700 meters, and salinities between 30.4 – 35.3‰.

Spawning Adults: Bottom habitats with a substrate of soft mud, clay, sand, or gravel in the Gulf of Maine and Georges Bank, as well as rough or rocky bottom locations along the slopes of the outer banks. Generally, the following conditions exist where spawning Atlantic halibut adults are found: water temperatures below 7^0 C, water depths less than 700 meters, and salinities less than 35‰. Atlantic halibut are most often observed spawning between late fall and early spring, with peaks in November and December.

Atlantic sea herring (*Clupea harengus*) –
Larvae: Pelagic waters in the Gulf of Maine, Georges Bank, and southern New England that comprise 90% of the observed range of Atlantic herring larvae. Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16^0 C,

water depths from 50 - 90 meters, and salinities around 32‰. Atlantic herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10^0 C, water depths from 15 - 135 meters, and salinity range from 26 to 32‰.

Adults: Pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10^0 C, water depths from 20 - 130 meters, and salinities above 28‰.

Bluefish (*Pomatomus saltatrix*) –
Juveniles: 1) North of Cape Hatteras, pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts south to Cape Hatteras, in the highest 90% of the area where juvenile bluefish are collected in the NEFSC trawl survey; 2) south of Cape Hatteras, 100% of the pelagic waters over the Continental Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida; 3) the "slope sea" and Gulf Stream Between latitudes 29^0 00 N and 40 00 N; and 4) all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Generally, juvenile bluefish occur in North Atlantic estuaries from June through October, mid-Atlantic estuaries from May through October, and south Atlantic estuaries March through December, within the "mixing" and "seawater" zone. Distribution of juveniles by temperature, salinity, and depth over the Continental Shelf is undescribed.

Adults: 1) North of Cape Hatteras, over the Continental Shelf (from the coast out to the limits of the EEZ), from Cape Cod Bay, Massachusetts south to Cape Hatteras, in the highest 90% of the area where adult bluefish were collected in the NEFSC trawl survey; 2) south of Cape Hatteras, 100% of the pelagic waters over the Contintenal Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida; and all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Adult bluefish are found in North Atlantic estuaries from June through October, mid-Atlantic estuaries from April through October, and south Atlantic estuaries from May through January in the "mixing" and "seawater" zones. Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in normal shelf salinities (>25 ppt).

Atlantic mackerel (*Scomber scombrus*) –
Juveniles: EFH is the pelagic water found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that encompass the highest 75% of the catch where juvenile Atlantic mackerel were collected in the NEFSC trawl surveys. EFH is also the "mixing" and /or "seawater" portions of all the estuaries

where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia. Generally, juveniles Atlantic mackerel are collected from shore to 1050 feet and temperatures between 39^0 F and 72^0 F.

Adults: EFH is the pelagic water found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine through Cape Hatteras, North Carolina in areas that encompass the highest 75% of the catch where adult Atlantic mackerel were collected in the NEFSC trawl surveys. EFH is also the "mixing" and /or "seawater" portions of all the estuaries where Atlantic mackerel are "common", "abundant", or "highly abundant" on the Atlantic coast, from Passamaquaddy Bay, Maine to James River, Virginia. Generally, adult Atlantic mackerel are collected from shore to 1,250 feet and temperatures between 39^0 F and 61^0 F.

Finding of No Significant Impact

This EA covers the proposed dredging of two portions of the 27-foot deep Kennebec River, Maine Federal navigation channel during August of 2011. Shoaling of the channel has reduced the controlling depth to 19.7 feet in some areas of the channel, and is hindering the safe passage U.S. Navy vessels scheduled to transit the channel. Dredging of the channel is necessary in order to transit the U.S. Navy Destroyer the U.S.S. SPRUANCE which is scheduled to depart from Bath Iron Works on September 1, 2011. Work will be performed by a hopper dredge and take about two weeks to complete. A mechanical dredge is not the preferred method due to the currents in the Kennebec River and the additional time that will be required for this type of dredge to complete the work. The proposed work will involve the removal of about 70,000 cubic yards (cy) of sand. Approximately 50,000 cy will be removed from the Doubling Point area, and approximately 20,000 cy from the area near Popham Beach. Due to the critical need to move the ship on the scheduled date, it will be necessary to dredge the channel outside November 1 – April 30 dredging window that was recommended by the National Marine Fisheries Service to minimize impacts to the endangered shortnose sturgeon.

Material dredged from the Doubling Point area will be disposed of at the previously used disposal site north of Bluff Head in about 95 to 100 feet of water. Material dredged from the Popham Beach area will be disposed at a 500 yard circular disposal site located about 0.4 nautical miles south of Jackknife Ledge in depths of about 40 to 50 feet below MLW (See Figures 1 and 2 in Environmental Assessment).

This assessment has been prepared in accordance with the National Environmental Policy Act of 1969 and all applicable environmental statutes and executive orders. My determination is based upon the information contained in the Environmental Assessment and the following considerations.

a). The project will not significantly adversely affect any state or federal rare, threatened or endangered species pursuant to the Endangered Species Act. A Biological Assessment and Biological Opinion were prepared for shortnose sturgeon in 1997 and a Biological Opinion for the 2003 emergency dredging was prepared in 2004. That Biological Opinion, and additional coordination with the National Marine Fisheries Service, stated that the proposed project may affect, but not jeopardize the continued existence of the endangered Kennebec River SNS population or species as a whole (i.e. no jeopardy decision). The project is also not expected to jeopardize the Kennebec River population of the Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon (*Salmo salar*). since the work will conducted away from the freshwater spawning areas, and generally outside of the migration periods for spawning adults and down migrating smolts and post spawning adults. Coordination with the National Marine Fisheries Service (NMFS) for this species is in progress.

b). Based on historic and recent grain size analyses, material at the project site is clean sand and will have no significant adverse effect upon existing water quality in the dredging or disposal areas.

c). A temporary impact will be caused by removal of benthic organisms from the Federal channel by dredging operations, and by burial with deposition of sediments at the disposal sites. These organisms will be replaced by recolonization from adjacent areas and larval recruitment within 2 or 3 years.

d). Dredging and disposal operations will cause minimal turbidity and sedimentation increases in the immediate vicinity of the project area. These effects will be of short duration, with turbidity impacts ceasing upon project completion.

e). As a result of coordination with the State Historic Preservation Office, no cultural resources are expected to be impacted by the proposed dredging or disposal activities.

f). Coordination with the National Marine Fisheries Service will continue on issues related to Essential Fish Habitat for long-term approvals, and future dredging actions will be based on this planning and consultation.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the maintenance dredging of the Kennebec River in August, 2011 is not a major Federal action significantly affecting the quality of the human environment. It is my determination therefore that this project is exempt from requirements to prepare an Environmental Impact Statement.

Date

Phillip T. Feir
Colonel, Corps of Engineers
District Engineer